

**SAFETY COMPLIANCE TESTING FOR FMVSS 201U**  
**Occupant Protection In Interior Impact**  
**Upper Interior Head Impact Protection**

**FUJI HEAVY INDUSTRIES, LTD.**  
**2005 Subaru Outback 4-Door Wagon**  
**NHTSA No. C55501**

**MGA RESEARCH CORPORATION**  
**446 Executive Drive**  
**Troy, Michigan 48083**



**Test Dates: November 30 – December 1, 2004**  
**Report Date: December 3, 2004**

**FINAL REPORT**

**PREPARED FOR:**

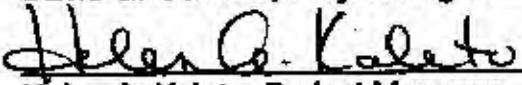
**U.S. DEPARTMENT OF TRANSPORTATION**  
**NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**  
**ENFORCEMENT**  
**OFFICE OF VEHICLE SAFETY COMPLIANCE**  
**400 SEVENTH STREET, SW**  
**ROOM 6111 (NVS-220)**  
**WASHINGTON, D.C. 20590**

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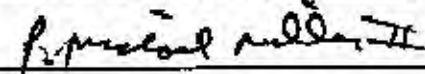
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Prepared By:

  
David G. Gotwals, Project Engineer

  
Helen A. Kaleto, Project Manager

Approved By:

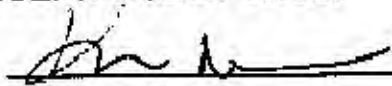


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7. Author(s) Helen A. Kaleto, Project Manager David G. Gotwals, Project Engineer				8. Performing Organization Report No. 201U-MGA-05-02	
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12. Sponsoring Agency Name and Address U.S. Department Of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance (NVS-220) 400 7 <sup>th</sup> Street, S.W., Room 6111 Washington, D.C. 20590				13. Type of Report and Period Covered Final Test Report	
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16. Abstract A compliance test series was conducted on the subject 2005 Subaru Outback 4-Door Wagon, NHTSA No. C55501, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201U compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on November 30 - December 1, 2004. Test failures identified were as follows: <p align="center">None</p> The data recorded seems to indicate that the 2005 Subaru Outback 4-Door Wagon tested appears to comply with the requirements for FMVSS 201U which were set forth by the National Highway Traffic Safety Administration.					
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## **1.0 PURPOSE OF COMPLIANCE TEST**

The purpose of this head impact compliance test was to determine whether the subject vehicle, a 2005 Subaru Outback 4-Door Wagon, meets the performance requirements of FMVSS 201U, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted during November 30 – December 1, 2004 on a 2005 Subaru Outback 4-Door Wagon manufactured by Fuji Heavy Industries, Ltd.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U\_FRAME#2 dated March 20, 2003.

All tests were conducted at MGA Research Corporation in Troy, Michigan and were performed by MGA engineers and technicians. The FMVSS 201U impactor test machine was used to conduct the testing. Target locations were determined by using a Coordinate Measurement Machine in conjunction with the MGA EZ-Target™ program and MGA procedure MGATP201U\_Test Series dated March 20, 2003.

## 2.0 COMPLIANCE TEST DATA SUMMARY

The 2005 Subaru Outback 4-Door Wagon was equipped with A, B, C, and rear-pillars, grab handles above all four doors, an adjustable seat belt anchorage on each B-pillar, a seat belt anchorage on each C-pillar and the rear upper roof zone, light consoles on the front, middle, and rear upper roof zones, and a side rail curtain airbag.

Upon completion of targeting the test vehicle, twelve (12) targets were chosen to be impacted based upon engineering judgment and certification test data provided by Fuji Heavy Industries, Ltd. Targets were chosen which appeared most likely to give high HIC(d) values. The twelve (12) targets chosen were:

AP1	BP2	FH1	UR4
AP2	BP3	UR1	UR5
AP3	OP2	UR3	UR6

The 2005 Subaru Outback 4-Door Wagon tested appears to comply with the performance criteria for FMVSS 201U. The HIC(d) measured using the Part 572L (Free Motion Headform) was below 1000 for each tested component.

**TABLE 2-1**  
**SUMMARY TABLE OF TEST RESULTS**

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

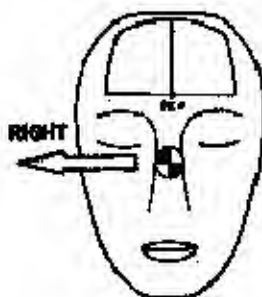
VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (lph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	108	29	18.8	358	254	33	5 Left
AP2	Left	204	46	18.6	334	222	23	6 Left
AP3	Right	158	45	19.4	322	206	17	0
BP2	Right	80	7	23.6	635	621	10	20 Left
BP3	Left	270	-2	23.6	594	567	20	37 Left
OP2	Right	80	0	23.9	609	567	22	3 Right
FH1	Right	180	50	23.5	770	800	11	6 Right
UR1	Left	270	32	23.9	542	498	60	17 Right
UR3	Left	270	32	23.7	847	902	15	5 Left
UR4	Right	15	50	24.2	308	188	22	7 Left
UR5	Right	90	31	23.5	679	679	40	0
UR6	Right	90	33	23.9	661	663	52	13 Left

Above and left/right refers to the position relative to reference pt. 0 where the target made contact with the Free Motion Headform. See the diagram below for details.



**POST TEST COMMENTS:**

The following description lists any post-test damage or other test observations for each target.

AP1 Right: Headliner deformation.

UR1 Left: Grab handle was broken during impact. Headliner deformation.

UR3 Left: Headliner deformation.

UR5 Right: Headliner displacement.

UR6 Right: The grab handle broke off the mount.

**REMARKS:**

The targets listed were impacted in the following order:

Right: BP2, UR5, UR6, QP2, UR4, FH1, AP3, AP1

Left: AP2, UR1, BP3, UR3

The 150 mm rule was observed for targets horizontal to each other and the 200 mm rule was observed for vertical components.

Targets AP1, AP2, and AP3 were located within the side airbag zone, so the impact velocity was reduced to 18 kph.

RECORDED BY: David G. Gotwals

DATE: December 1, 2004

APPROVED BY: Helen A. Kalet

**TABLE 2-2**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

INTERIOR TRIM INFORMATION: A, B, C, and rear pillars, grab handles above all four doors, an adjustable seat belt anchorage on each B-pillar, a seat belt anchorage on above each C-pillar and the rear upper roof zone, light consoles on the front, middle, and rear upper roof zones, and a side rail curtain airbag.

**SUNROOF INFORMATION:**

Installed:        Yes   X   No  
 Operation:        Electric        Manual

**ROLL-BAR INFORMATION:**

Installed:        Yes   X   No  
 Padded:        Yes   X   No  
 Braces:        Yes   X   No

**GENERAL INFORMATION:**

Date Received: November 17, 2004; Odometer Reading 25 miles

**DATA FROM VEHICLE'S CERTIFICATION LABEL:**

Vehicle Manufactured By: Fuji Heavy Industries, Ltd.

Date of Manufacture: August, 2004; VIN: 4S4BP61C256325474

GVWR: 2010 kg; GAWR FRONT: 1040 kg;

GAWR REAR: 1060 kg

**DATA FROM TIRE PLACARD:**

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 220 kpa

REAR: 210 kpa

Recommended Tire Size: P225/60R16; Load Range: 408 kg

Recommended Cold Tire Pressure:

FRONT: 220 kpa REAR: 210 kpa

Size of Tire on Test Vehicle: P225/60R16

Type of Spare Tire: T155/70D17 Saver: X; Standard     

#### VEHICLE CAPACITY DATA:

Type of Front Seats: Bench     ; Bucket X; Split Bench     

Number of Occupants: Front 2; Rear 3; TOTAL 5

VEHICLE CAPACITY WEIGHT (VCW) = 408 kg

No. of Occupants x 88 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 68 kg (difference)

#### WEIGHT OF TEST VEHICLE AS DELIVERED AT LABORATORY: (with maximum fluids)

Right Front = 402.5 kg Right Rear = 353.0 kg

Left Front = 410.5 kg Left Rear = 365.5 kg

TOTAL FRONT = 813.0 kg TOTAL REAR = 718.5 kg

% Total Weight = 53.1 % % Total Weight = 46.9 %

TOTAL DELIVERED WEIGHT = 1531.5 kg

#### CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1531.5 kg

Rated Cargo/Luggage Weight = 68.0 kg

Target Test Weight = 1599.5 kg

#### WEIGHT OF TEST VEHICLE:

Right Front = 401.0 kg Right Rear = 387.5 kg

Left Front = 410.0 kg Left Rear = 402.0 kg

TOTAL FRONT = 811.0 kg TOTAL REAR = 789.5 kg

% Total Weight = 50.7 % % Total Weight = 49.3 %

TOTAL TEST WEIGHT = 1600.5 kg

Weight of ballast secured in vehicle's cargo area = 69.0 kg



## TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 766.0 mm; Left Front 761.0 mm;  
 Right Rear 778.0 mm; Left Rear 770.0 mm;  
 Pitch Angle at Right Door Sill = 0.3 Front higher  
 Pitch Angle at Left Door Sill = -0.2 Front higher  
 Roll Angle at Front Bumper = -0.3 Right higher  
 Roll Angle at Rear Bumper = -0.2 Right higher

FULLY LOADED: Right Front 769.0 mm; Left Front 763.0 mm;  
 Right Rear 767.0 mm; Left Rear 761.0 mm;  
 Pitch Angle at Right Door Sill = 0.1 Front higher  
 Pitch Angle at Left Door Sill = 0.1 Rear higher  
 Roll Angle at Front Bumper = -0.4 Right higher  
 Roll Angle at Rear Bumper = -0.2 Right higher

AS TARGETED: Right Front 901.0 mm; Left Front 900.0 mm;  
 Right Rear 897.0 mm; Left Rear 896.0 mm;  
 Pitch Angle at Right Door Sill = 0.2 Front higher  
 Pitch Angle at Left Door Sill = 0.1 Rear higher  
 Roll Angle at Front Bumper = -0.4 Right higher  
 Roll Angle at Rear Bumper = -0.2 Right higher

## AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill = 0.2 Front higher  
 Pitch Angle at Left Door Sill = 0.0  
 Roll Angle at Front Bumper = -0.4 Right higher  
 Roll Angle at Rear Bumper = -0.2 Right higher

## AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill = 0.2 Front higher  
 Pitch Angle at Left Door Sill = 0.0  
 Roll Angle at Front Bumper = -0.3 Right higher  
 Roll Angle at Rear Bumper = -0.2 Right higher

VEHICLE WHEELBASE = 2680 mm

REMARKS: The seat travel distance was measured to be 216 mm for the driver front seat and 216 mm for the passenger front seat.

RECORDED BY: David G. Gotwals

DATE: November 17, 2004

APPROVED BY: Helen A. Kaleta

TABLE 2-3

## HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door WagonVEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: GoldVEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195°-255°	L 203.9°	L 251.2°
	R 105°-165°	R 107.8°	R 156.1°
B-PILLAR	L 195°-345°	L 200.4°	L 284.7°
	R 15°-165°	R 75.4°	R 160.3°

S DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: David G. GotwalsDATE: November 17, 2004APPROVED BY: Helen A. Kaleta

TABLE 2-4

## VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door WagonVEH. NHTSA NO.: C55501 VIN: 4S4BP61C250325474 COLOR: GoldVEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

## VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE		MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
	FH2	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
SIDE RAIL	SR1	L	0°-50°	L 0°	L 30°
		R	0°-50°	R 0°	R 29°
	SR2A	L	0°-50°	L 0°	L 23°
		R	0°-50°	R 0°	R 20°
	SR2B	L	0°-50°	L 0°	L 27°
		R	0°-50°	R 0°	R 38°
	SR3-1	L	0°-50°	L 0°	L 21°
		R	0°-50°	R 0°	R 19°
	SR3-2	L	0°-50°	L 0°	L 22°
		R	0°-50°	R 0°	R 20°
	SR3-3	L	0°-50°	L 0°	L 41°
		R	0°-50°	R 0°	R 46°
REAR HEADER	RH	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
A-PILLAR	AP1	L	-5°-50°	L -5°	L 29°
		R	-5°-50°	R -5°	R 29°

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
	AP2	L    -5°-50°	L    -5°	L    46°
		R    -5°-50°	R    -5°	R    47
	AP3	L    -5°-50°	L    -5°	L    44°
		R    -5°-50°	R    -5°	R    45°
B-PILLAR	BP1	L    -10°-50°	L    -10°	L    22°
		R    -10°-50°	R    -10°	R    22°
	BP2*	L    0°-50°	L    0°	L    7°
		R    0°-50°	R    0°	R    7°
	BP3	L    -10°-50°	L    -10°	L    -2°
		R    -10°-50°	R    -10°	R    -6°
	BP4	L    -10°-50°	L    -10°	L    0°
		R    -10°-50°	R    -10°	R    0°
OTHER PILLAR	OP1	L    -10°-50°	L    -10°	L    26°
		R    -10°-50°	R    -10°	R    25°
	OP2	L    -10°-50°	L    -10°	L    5°
		R    -10°-50°	R    -10°	R    0°
REAR PILLAR	RP1	L    -10°-50°	L    -10°	L    43°
		R    -10°-50°	R    -10°	R    33°
	RP2	L    -10°-50°	L    -10°	L    6°
		R    -10°-50°	R    -10°	R    8°
UPPER ROOF 1		0°-50°	0°	32°
UPPER ROOF 2		0°-50°	0°	33°
UPPER ROOF 3		0°-50°	0°	32°
UPPER ROOF 4		0°-50°	0°	50°
UPPER ROOF 5		0°-50°	0°	31°
UPPER ROOF 6		0°-50°	0°	35°

As determined using the Procedures specified in §8.13.4.2. \*Target BP2 is a seat belt anchorage location.

RECORDED BY: David G. Gotwals      DATE: November 17, 2004

APPROVED BY: Helen A. Kaloto

TABLE 2-5

## TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door WagonVEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: GoldVEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	216.0 mm	216.0 mm
T°	Horizontal < (CG-F1 (Left Seat) to (Right A-Pillar))	108.8°	--
A1°	360° - T°	251.2°	--
W°	Horizontal < (CG-2 (Left Seat) to (Left A-Pillar))	203.9°	--
A2°	A2° = W°	203.9°	--
U°	Horizontal < (CG-2 (Left Seat) to (Left B-Pillar))	284.7°	--
B1°	B1° = U°	284.7°	--
V°	Horizontal < (CG-R (Left Seat) to (Left B-Pillar))	200.4°	--
B2°	B2° = V°	200.4°	--
W° (right)	Horizontal < (CG-F2 (Right Seat) to (Right A-Pillar))	--	158.1°
A1° (right)	A1° (right) = W° (right)	--	166.1°
T° (right)	Horizontal < (CG-F1 (Right Seat) to (Left A-Pillar))	--	262.2°
A2° (right)	360° - T° (right)	--	107.8°
V° (right)	Horizontal < (CG-R (Right Seat) to (Right B-Pillar))	--	160.3°
B1° (right)	B1° (right) = V° (right)	--	160.3°
U° (right)	Horizontal < (CG-F2 (Right Seat) to (Right B-Pillar))	--	75.4°
B2° (right)	B2° (right) = U° (right)	--	75.4°
J	A-Pillar ((Plane 3) - (Plane 5))	308.4 mm	308.7 mm
J/2	J ÷ 2	154.7 mm	154.4 mm
D1	Upper Roof ((Plane A) - (Plane B))	2107.0 mm	
D1/2	D1 ÷ 2	1053.5 mm	
D2	Upper Roof ((Plane C) - (Plane D))	1210.3 mm	
D2/2	D2 ÷ 2	605.2 mm	
.35D1	.35 x D1	737.5 mm	
.35D2	.35 x D2	423.6 mm	



Measurement	Description	Left Side	Right Side
N	B-Pillar ((BP1) - (lowest point on daylight opening forward of B-Pillar))	417.5 mm	413.9 mm
N/2	B-Pillar ((BP3) - (lowest point on daylight opening forward of B-Pillar))	208.8 mm	207.0 mm
N/4	B-Pillar ((BP4) - (lowest point on daylight opening forward of B-Pillar))	104.4 mm	103.5 mm
Q	O-Pillar (Plane 13 - Plane 14)	382.6 mm	385.6 mm
Q/2	Q / 2	191.3 mm	192.8 mm
D	R-Pillar (Point 7 - Point M)	855.0 mm	874.0 mm
3D/7	3 D / 7	366.4 mm	374.6 mm

As determined using the Procedures specified in S10.1-10.13.

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1284.4	-355.0	238.4	1284.4	355.0	248.4
Rear	2095.0	-345.0	284.4	2095.0	345.0	284.4

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1284.5	-353.4	224.1	1285.8	356.3	231.4
Rear	2093.4	-342.4	278.2	2094.6	347.4	275.5

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	1228.5	-353.4	884.1	1229.8	356.3	891.4
CGF2	1444.5	-353.4	884.1	1445.8	356.3	891.4
CGR	2253.4	-342.4	938.2	2254.8	347.4	935.5



## REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Driver seat front outboard anchorage (x, y, z) = 913.7, -574.0, 48.9

Driver door striker upper bolt (x, y, z) = 1409.4, -761.66, 374.6

Passenger door striker upper bolt (x, y, z) = 1409.4, 761.6, 374.6

## REMARKS:

RECORDED BY: David G. Gotwale

DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-6

## SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door WagonVEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: GoldVEH. BUILD DATE: August 2004 TEST DATES: November 30 – December 1, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
A-Pillar Left Side								
AP1	1088.3	-534.7	891.2	246	29	No	--	No
AP2	931.9	-585.3	803.4	204	48	No	—	Yes
AP3	811.3	-613.7	838.5	204	44	No	—	No
A-Pillar Right Side								
AP1	1092.5	532.2	988.8	108	29	No	--	Yes
AP2	935.6	590.8	803.4	156	47	No	—	No
AP3	808.7	611.9	838.7	156	45	No	—	Yes
B-Pillar Left Side								
BP1	1589.6	-470.6	1087.5	270	22	No	—	No
BP2	1538.1	-588.4	865.0	270	7	No	--	No
BP3	1507.1	-601.8	880.3	270	-2	No	--	Yes
BP4	1577.6	-638.7	776.8	200	0	No	—	No
B-Pillar Right Side								
BP1	1592.6	466.8	1084.2	90	22	No	--	No
BP2	1540.1	586.8	883.0	90	7	No	—	Yes
BP3	1511.9	599.4	878.9	90	-6	No	—	No
BP4	1580.4	634.0	776.3	159	0	No	—	No

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
Other Pillar Left Side								
OPR	2168.8	-458.9	1084.9	--	--	No	--	--
OP1	2168.8	-458.9	1084.9	270	26	No	--	No
OP2	2246.9	-595.3	893.9	270	5	No	--	No
Other Pillar Right Side								
OPR	2170.4	459.6	1085.4	--	--	No	--	--
OP1	2170.4	459.6	1085.4	90	25	No	--	No
OP2	2247.9	593.4	892.8	90	0	No	--	Yes
Rear Pillar Left Side								
RP1	2837.8	-505.2	1015.9	Target exempt from testing per S6.3(b).				--
RP2	3018.1	-581.0	885.8	Target exempt from testing per S6.3(b).				--
Rear Pillar Right Side								
RP1	2852.4	516.3	1010.6	Target exempt from testing per S6.3(b).				--
RP2	3029.2	571.7	860.1	Target exempt from testing per S6.3(b).				--
Front Header Left Side								
FH1	1017.9	-448.4	1050.2	--	--	Yes	--	--
REL	1012.1	-423.4	1049.3	180	50	--	1	No
FH2	992.9	-301.7	1057.0	180	50	No	--	No
Front Header Right Side								
FH1	1022.3	444.7	1048.0	--	--	Yes	--	--
REL	1013.7	420.9	1047.7	180	60	--	1	Yes
FH2	997.8	296.9	1056.0	180	50	No	--	No
Side Rail Left Side								
SR1	1240.2	-480.0	1058.6	270	30	No	--	No
SR2-A	1390.2	-472.4	1069.7	270	23	No	--	No
SR2-B	1290.8	-491.8	1077.1	--	--	Yes	--	--
REL	1294.0	-463.7	1080.4	270	27	--	1	No

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
SR3-1	1798.5	-460.2	1081.6	270	21	No	--	No
SR3-2	1982.3	-460.9	1077.9	270	22	No	--	No
SR3-3	2317.6	-474.9	1068.7	270	41	No	--	No
Side Rail Right Side								
SR1	1242.0	474.8	1058.4	90	29	No	--	No
SR2-A	1391.8	469.4	1068.9	90	20	No	--	No
SR2-B	1292.7	485.1	1078.6	--	--	Yes	--	--
REL	1290.9	458.8	1077.6	90	38	--	1	No
SR3-1	1800.2	459.5	1081.7	90	19	No	--	No
SR3-2	1961.5	458.4	1080.2	90	20	No	--	No
SR3-3	2320.5	475.3	1067.2	90	46	No	--	No
Rear Header Left Side								
RH	2808.5	-340.5	1053.7	Target exempt from testing per S6.3(b).				No
Rear Header Right Side								
RH	2818.1	347.9	1052.3	Target exempt from testing per S6.3(b).				No
Upper Roof Left Side								
UR1	1226.6	-418.7	1100.2	270	32	No	--	Yes
UR2	1585.4	-419.3	1119.7	270	33	No	--	No
UR3	2166.7	-418.8	1121.8	270	32	No	--	Yes
Upper Roof Right Side								
UR4	2679.7	358.0	1045.9	90	50	No	--	Yes
UR5	1592.5	415.0	1118.4	90	31	No	--	Yes
UR6	1365.9	384.6	1131.5	90	33	No	--	Yes

As determined using the Procedures specified in S10.1-10.13.

REMARKS: Targets RP1, RP2, and RH on each side were found to be greater than 600 mm rearward of the rearmost SgRP and therefore exempt from testing per S6.3(b).

RECORDED BY: David G. Gotwals

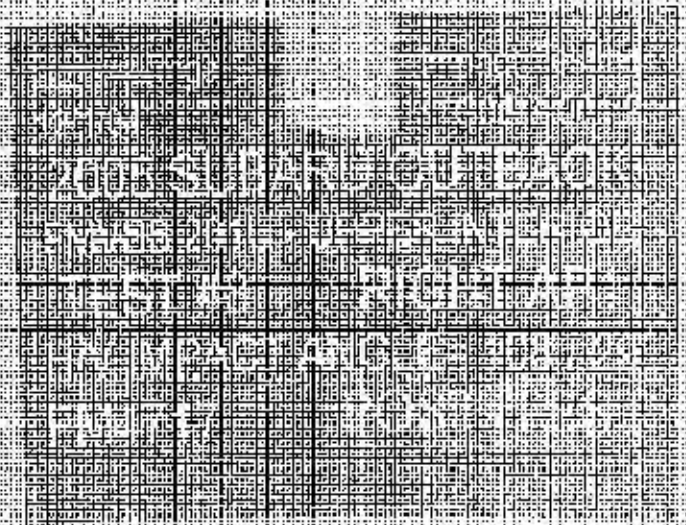
DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto

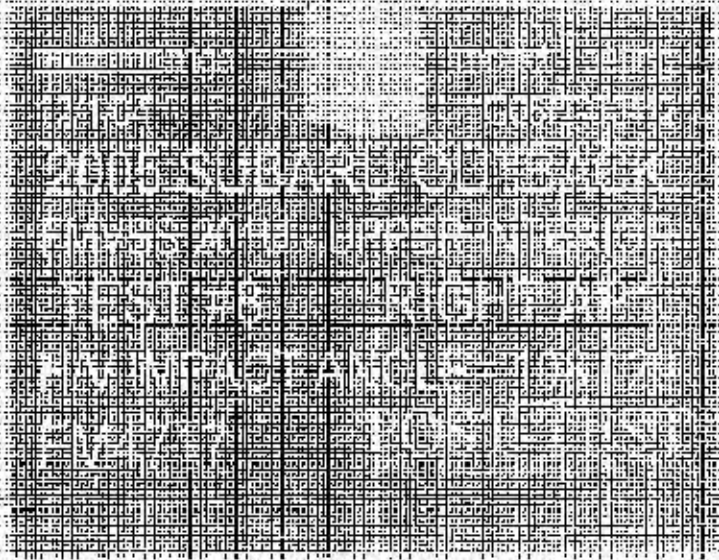


12104  
2005 SUBARU OUTBACK  
ENVSS 2010  
TEST #3  
HYPERFACE  
12104











MICHIGAN OPERATIONS  
DATE: 2/1/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.1  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 2010 TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP1Right

MGA Test Reference No.: FM4717

Approach Horizontal Angles: 108°

Approach Vertical Angles: 29°

Additional Description:

Test Number: #8

Temperature: 21°C

Humidity: 31%

Time of Test: 10:09 AM

FMH Serial No: 036

#### TEST RESULTS:

HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
358	254	6.4	18.8	33	5 L

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35923	-99.8	1.44	1.44
Y	6	J35918	99.7	1.54	1.54
Z	7	J35918	98.1	1.18	1.17

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation.

Recorded By: [Signature] Approved By: [Signature] Date: 12/1/04

\*Only necessary for NHTSA (Government) Compliance testing.

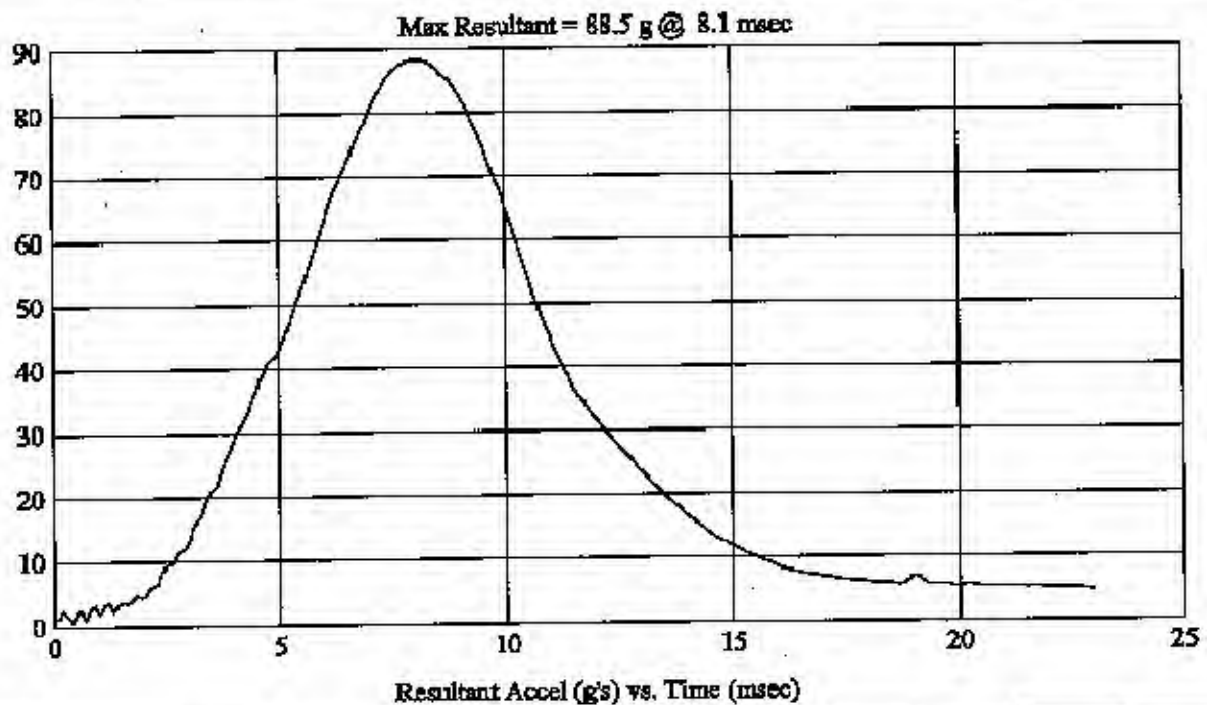
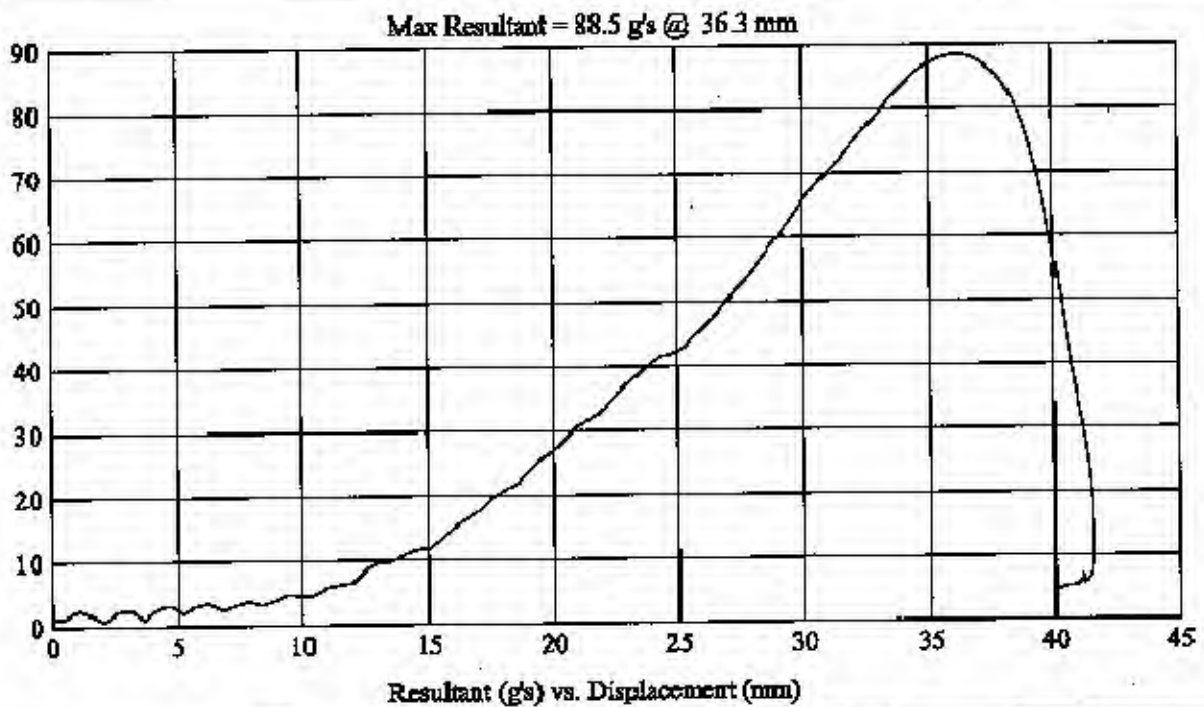
Customer: Subaru  
Test # 8  
FM4717  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: AP1  
Vehicle Side: Right  
Horz/Vert Angle: 108/29

HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

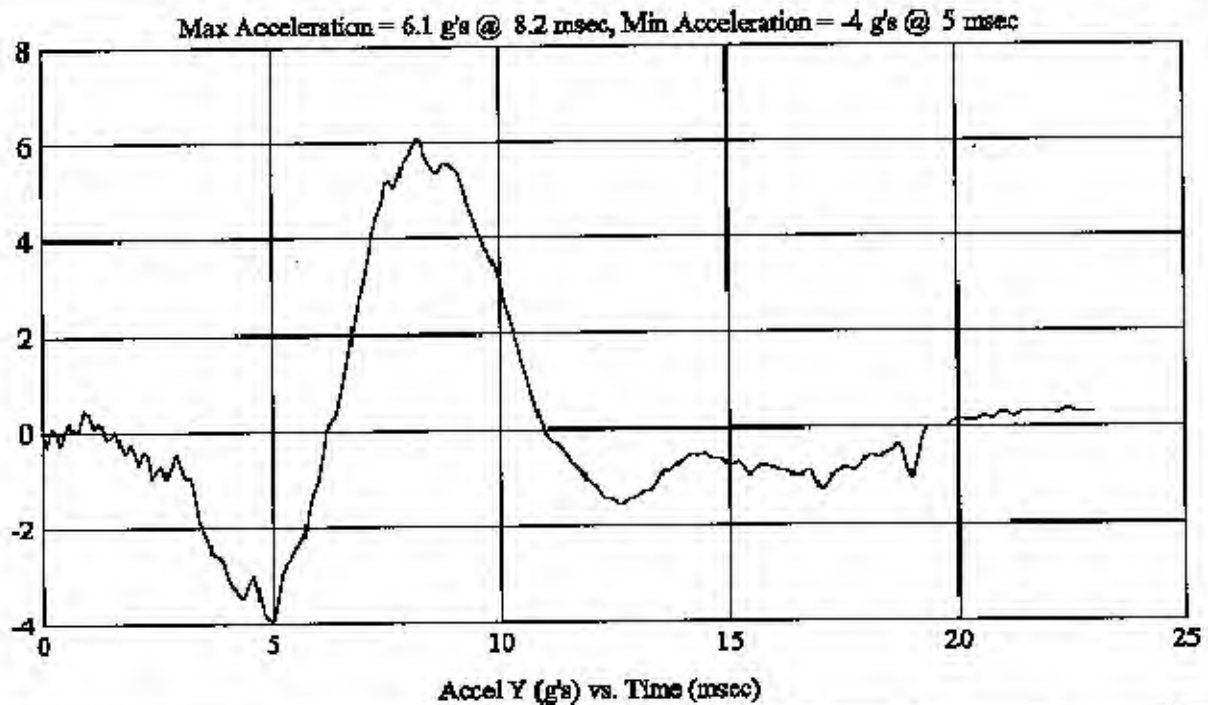
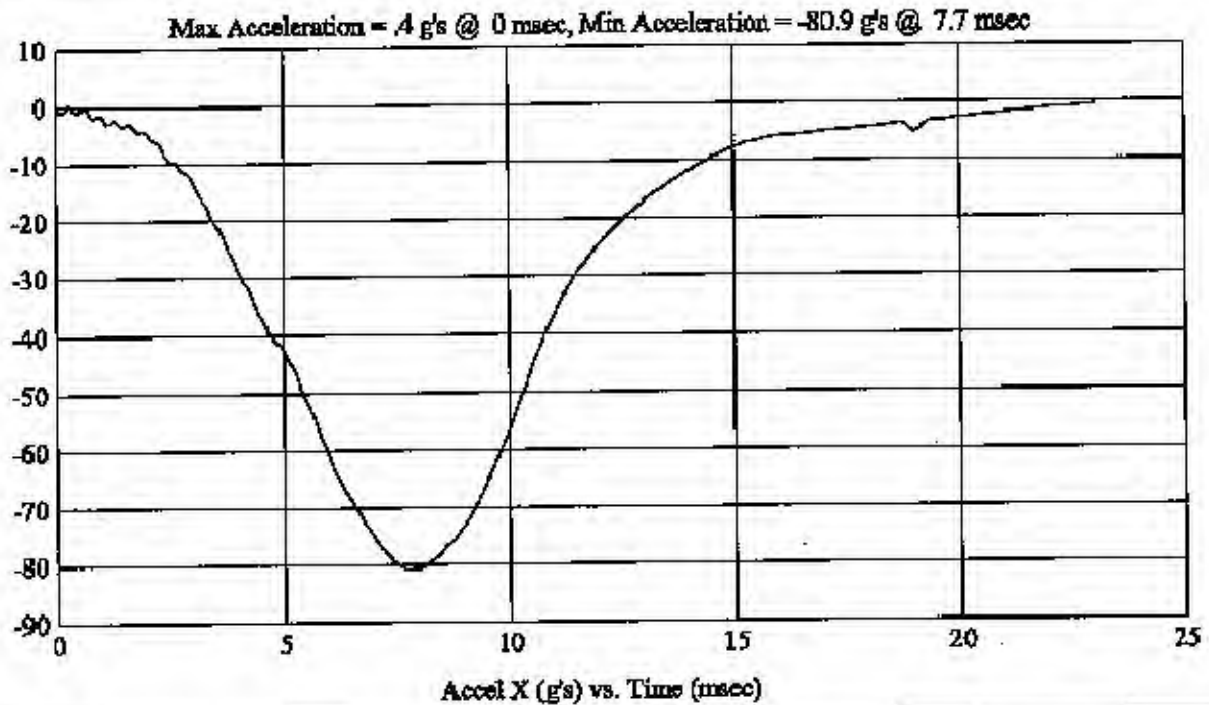


Customer: Subaru  
Test # 8  
FM4717  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP1  
Vehicle Side: Right  
Horz/Vert Angle: 108/29

HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

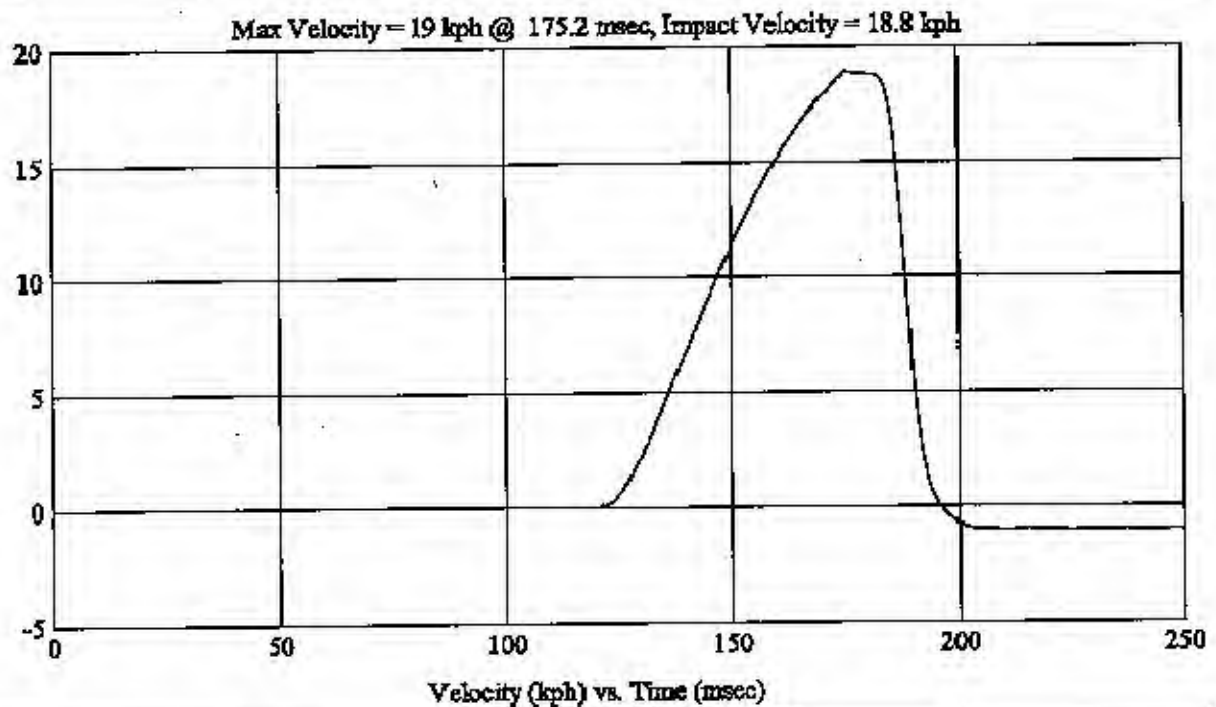
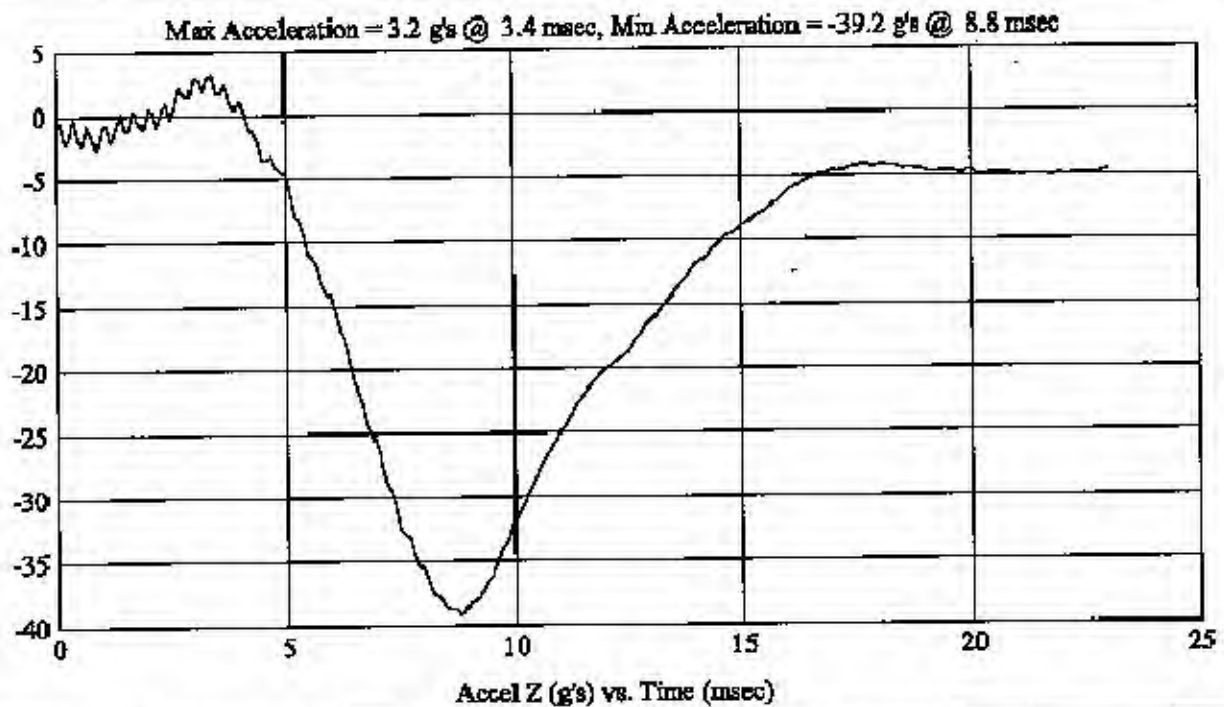


Customer: Subaru  
Test # 8  
FM4717  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP1  
Vehicle Side: Right  
Horz/Vert Angle: 108/29

HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

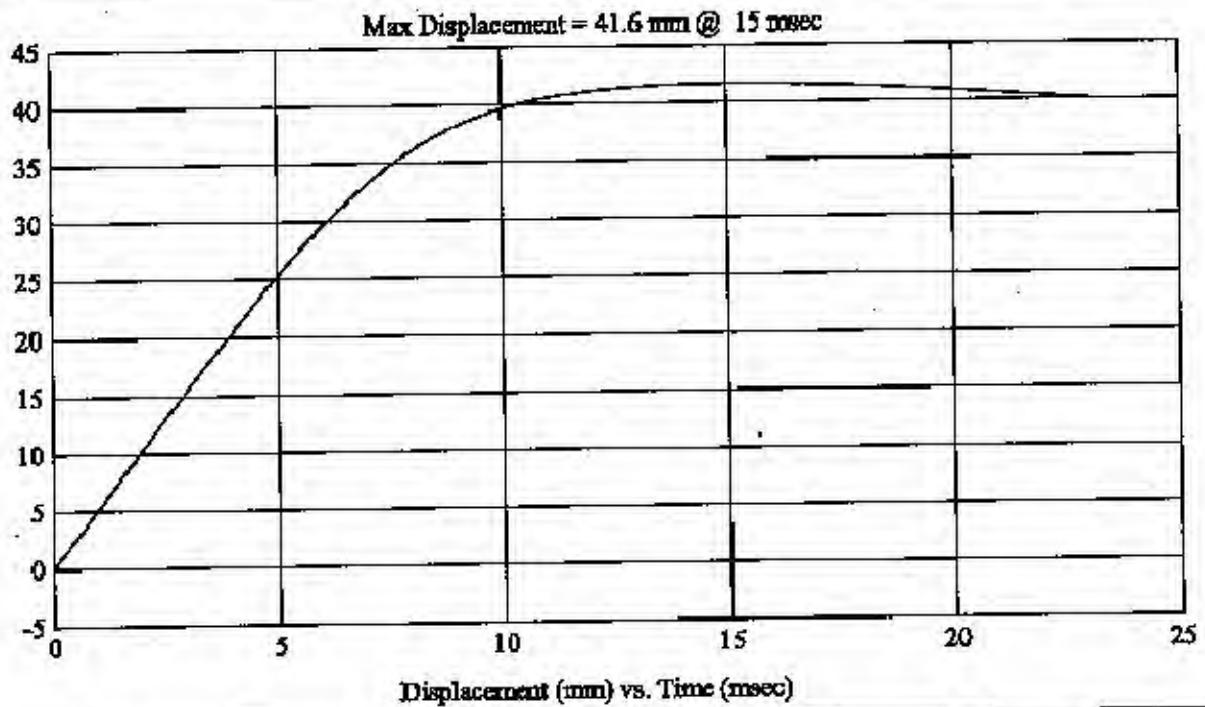


Customer: Subaru  
Test # 8  
FM4717  
Additional Desc: N/A

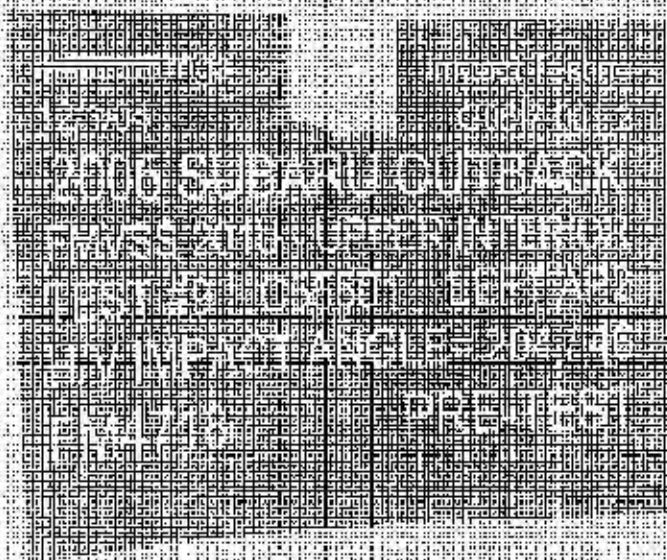
Vehicle Program: Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP1  
Vehicle Side: Right  
Horiz/Vert Angle: 108/29

HIC(d) = 358, HIC = 254, Delta T = 6.4 msec









12/1/04

IMPACT TESTING

G0517-0012

2005 SUBARU OUTBACK

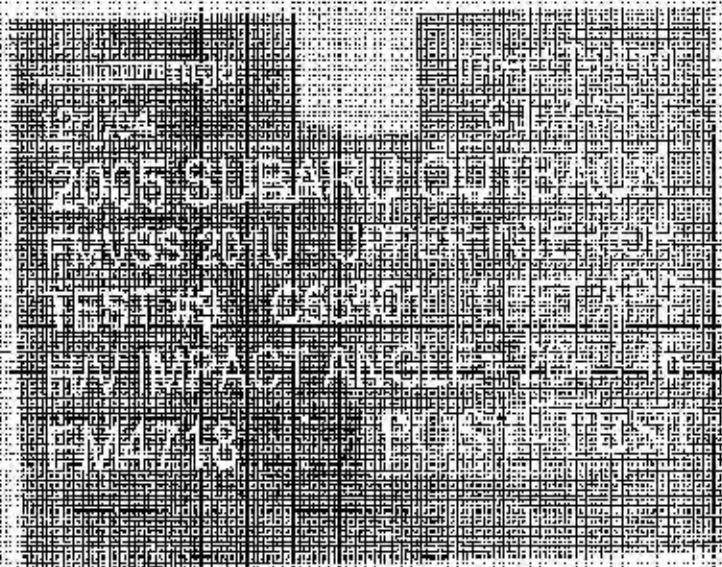
FMVSS 2010 - UPPER INTERIOR

TEST #9 C55501 LEFT AP2

HV IMPACT ANGLE = 204 / 46

FMV 713 POST TEST





MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGA/TP207210.2

DOC. NO.: MGA/TP207210.3  
REVISION NO.: 2  
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### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP2 Left

MGA Test Reference No.: FM4718

Approach Horizontal Angles: 204°

Approach Vertical Angles: 46°

Additional Description:

Test Number: #9

Temperature: 21C

Humidity: 31%

Time of Test: 2:00 PM

FMH Serial No: 037

#### TEST RESULTS:


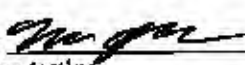
HIC(d)	HIC	$\Delta t$ (msac)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
334	222	11.6	18.8	23	6L

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35800	-98.4	1.44	1.44
Y	6	J35841	92.6	1.54	1.54
Z	7	J35791	88.8	1.18	1.17

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By:  Approved By:  Date: 12/1/04

\*Only necessary for NHTSA (Government) Compliance testing.

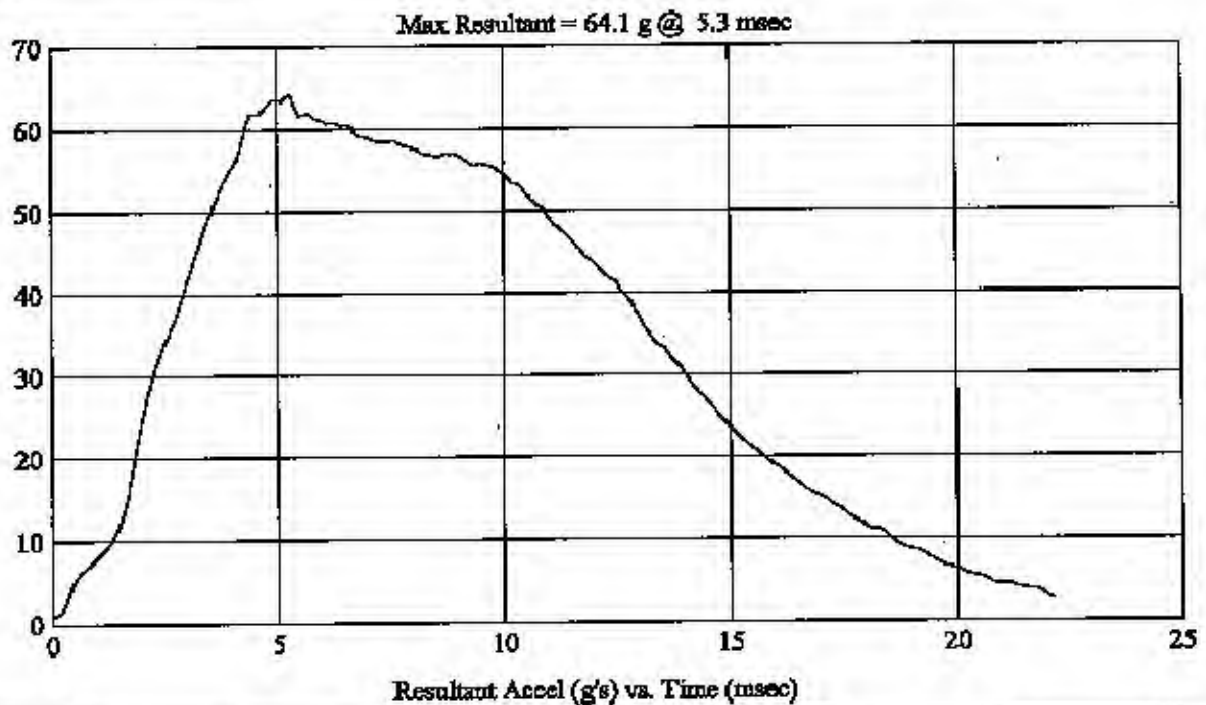
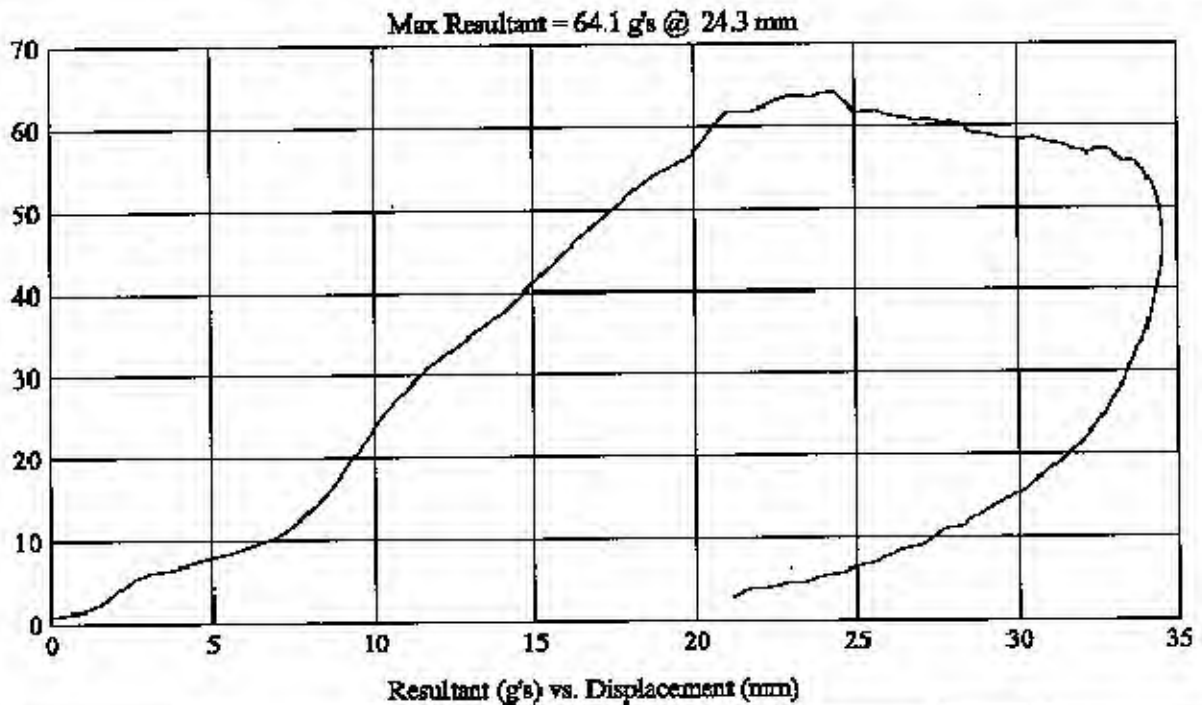
Customer: Subaru  
Test # 9  
FM4718  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: AP2  
Vehicle Side: Left  
Horz/Vert Angle: 204/46

HIC(a) = 334, HIC = 222, Delta T = 11.6 msec



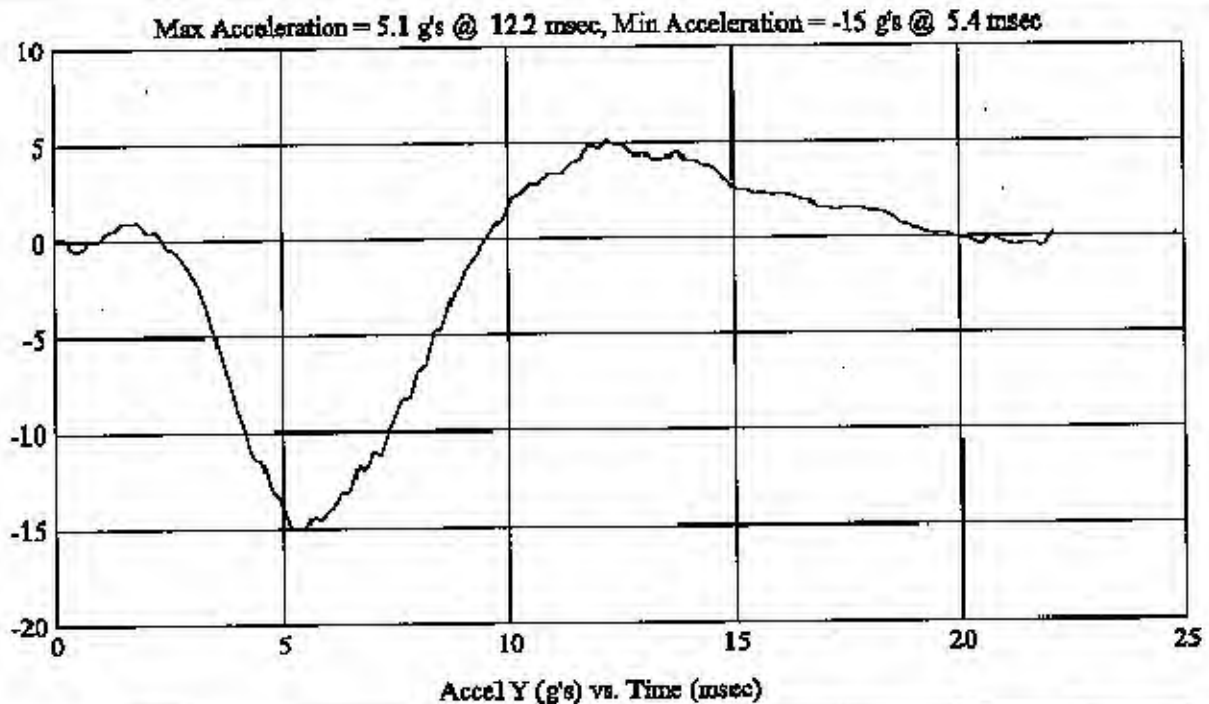
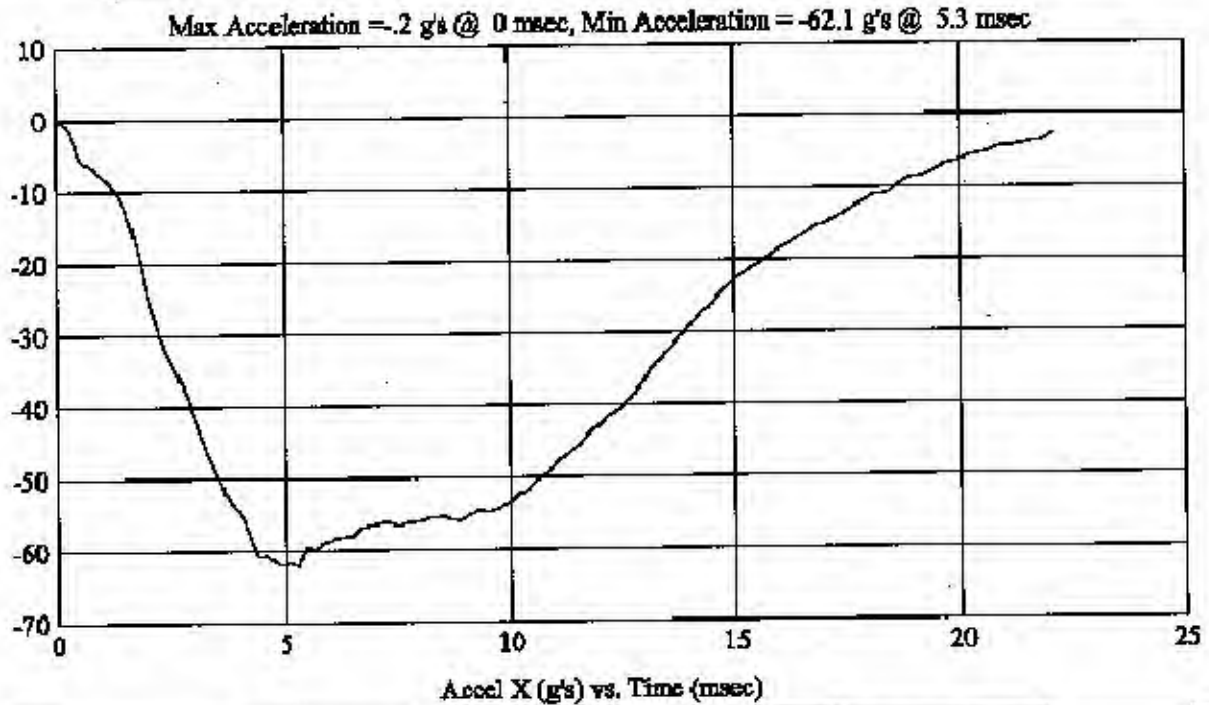


Customer: Subaru  
Test # 9  
FM4718  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP2  
Vehicle Side: Left  
Horiz/Vert Angle: 204/46

HIC(a) = 334, HIC = 222, Delta T = 11.6 msec

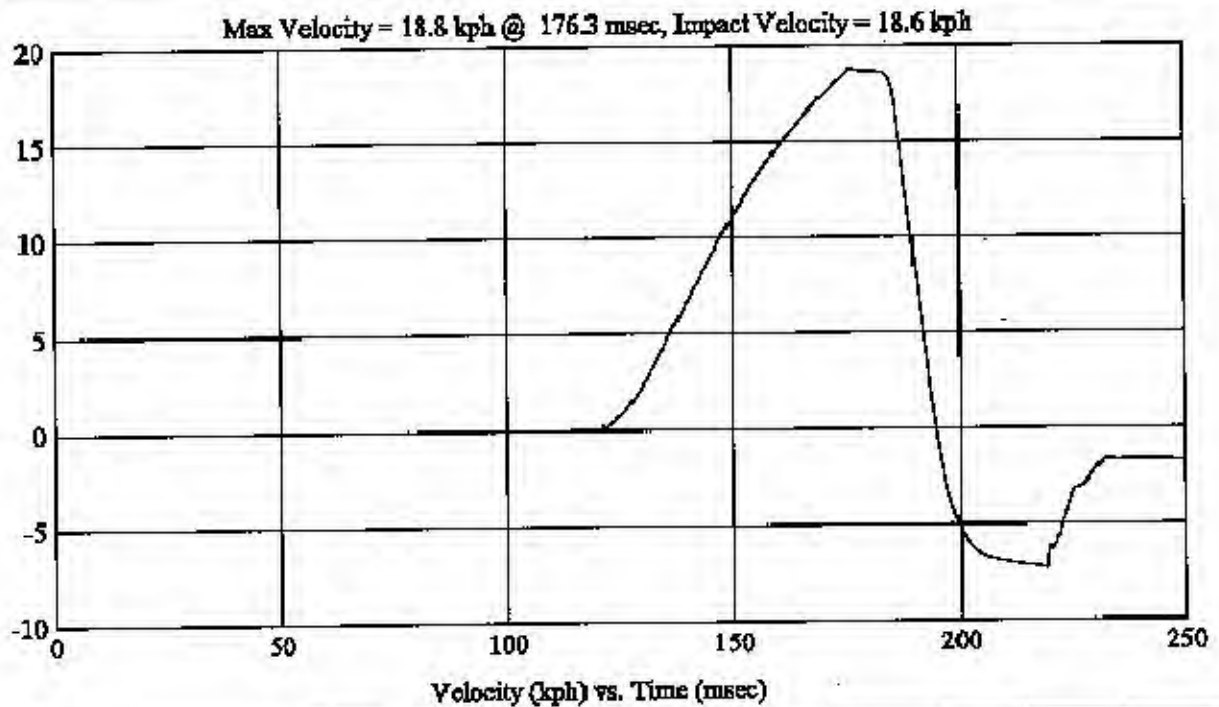
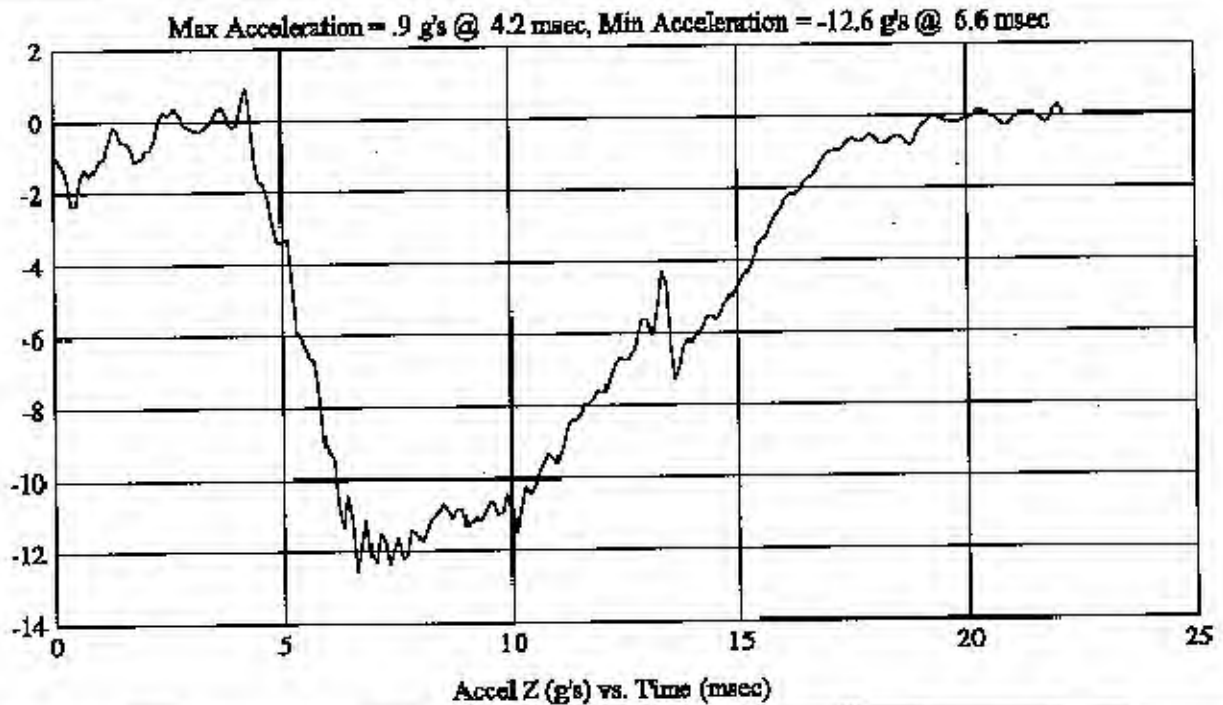


Customer: Subaru  
Test # 9  
FM4718  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP2  
Vehicle Side: Left  
Horz/Vert Angle: 204/46

HIC(d) = 334, HIC = 222, Delta T = 11.6 msec



FMH  
G05T7-001.2

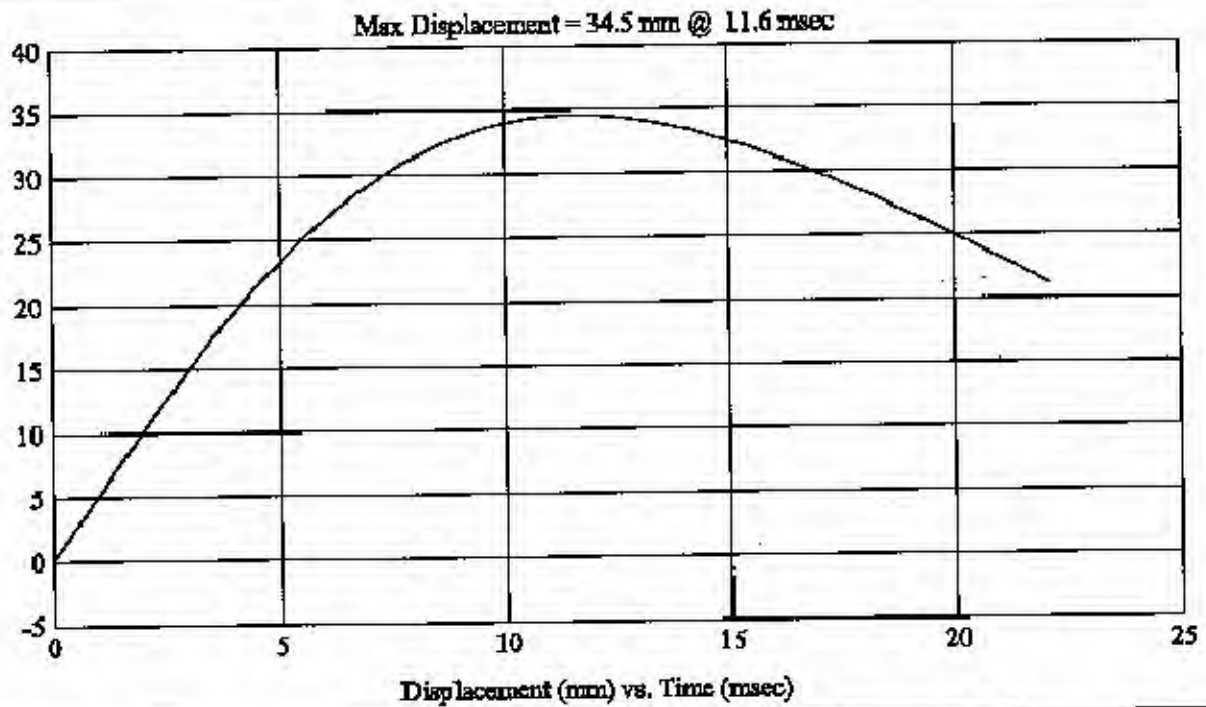
3-16

Customer: Subaru  
Test # 9  
FM4718  
Additional Desc: N/A

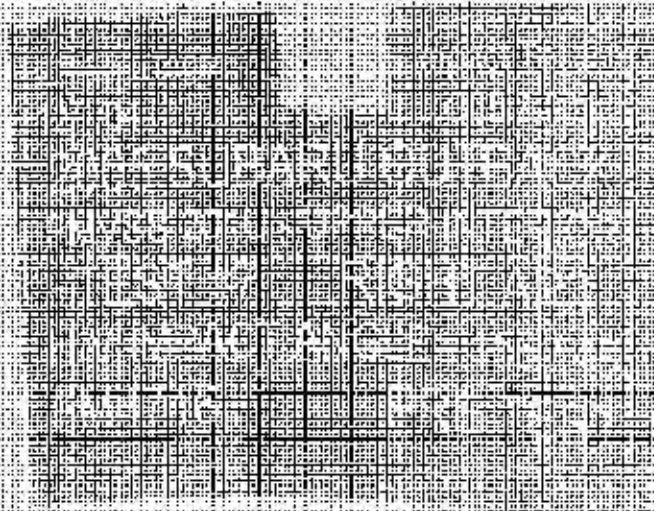
Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP2  
Vehicle Side: Left  
Horz/Vert Angle: 204/46

HIC(d) = 334, HIC = 222, Delta T = 11.6 msec



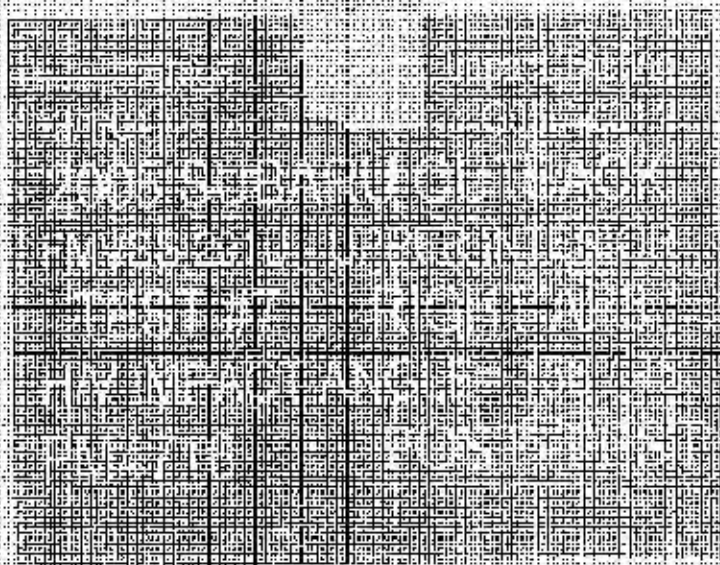












MICHIGAN OPERATIONS  
DATE: 2/3/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
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## SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL 2005/Subaru/Outback

## GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP3 Right

MGA Test Reference No.: FM4718

Approach Horizontal Angle: 156°

Approach Vertical Angle: 45°

Additional Description:

Test Number: #7

Temperature: 21°C

Humidity: 31%

Time of Test: 9:08 AM

FMH Serial No: 035

## TEST RESULTS:

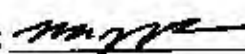
HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
322	206	14.2	19.4	17	0

## INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7284-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35924	-84.1	1.44	1.44
Y	6	J35919	94.3	1.54	1.54
Z	7	J22864	92.7	1.17	1.17

## REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By:  Approved By:  Date: 12/1/04

\*Only necessary for NHTSA (Government) Compliance testing.

FMH  
G0517-001.2

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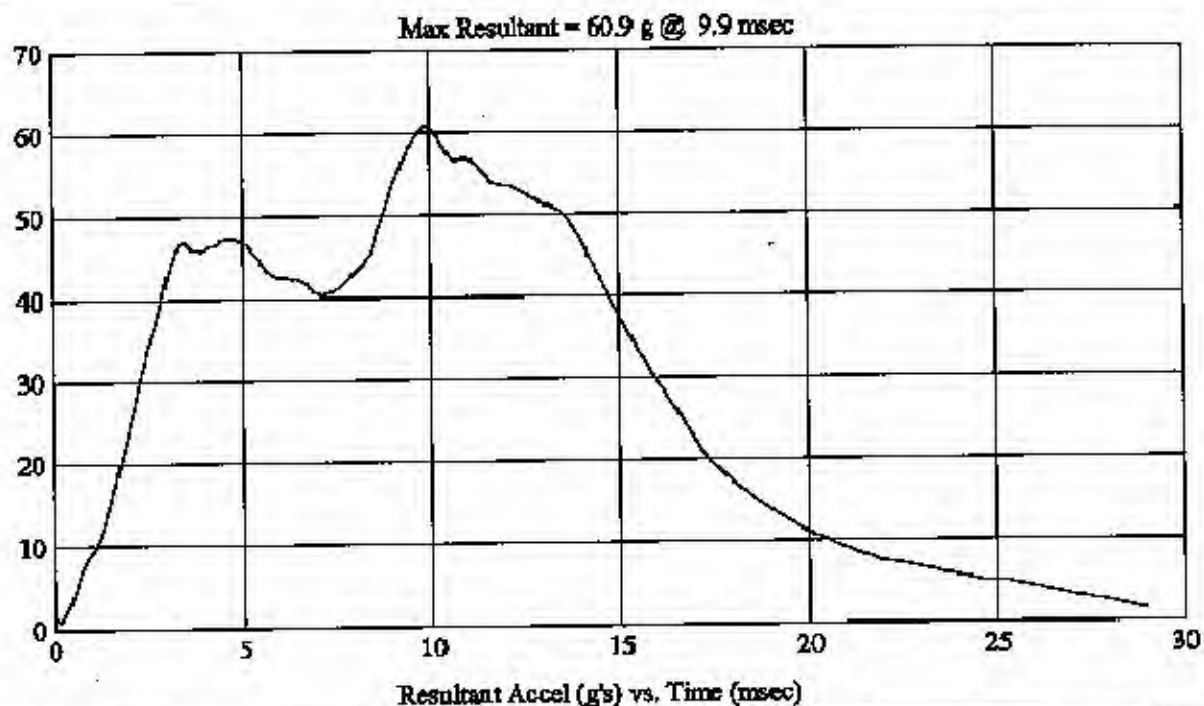
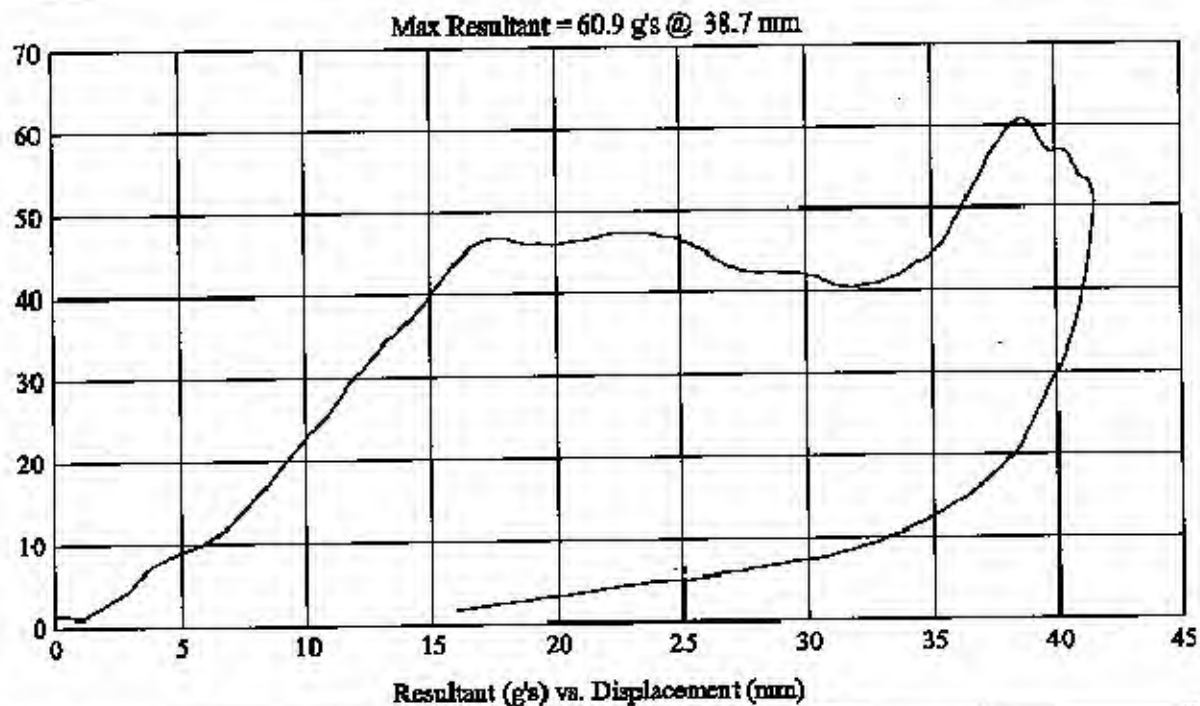
Customer: Subaru  
Test # 7  
FM4716  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: AP3  
Vehicle Side: Right  
Horz/Vert Angle: 156/45

HIC(d) = 322, HIC = 206, Delta T = 14.2 msec



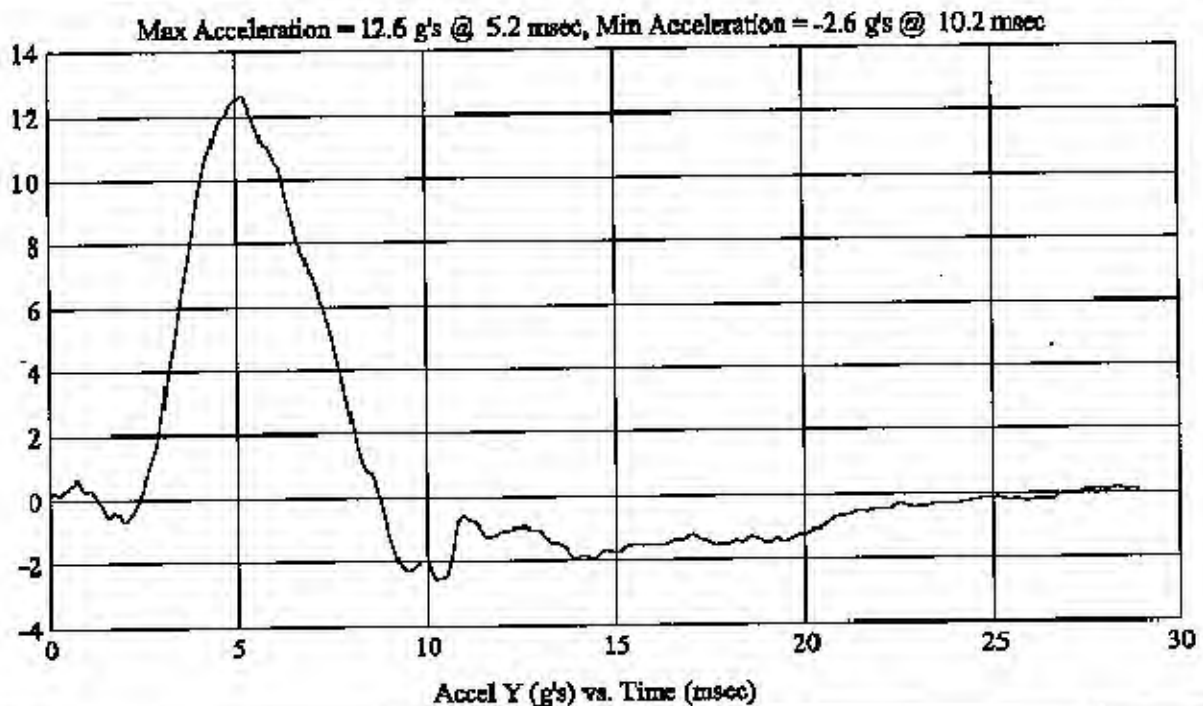
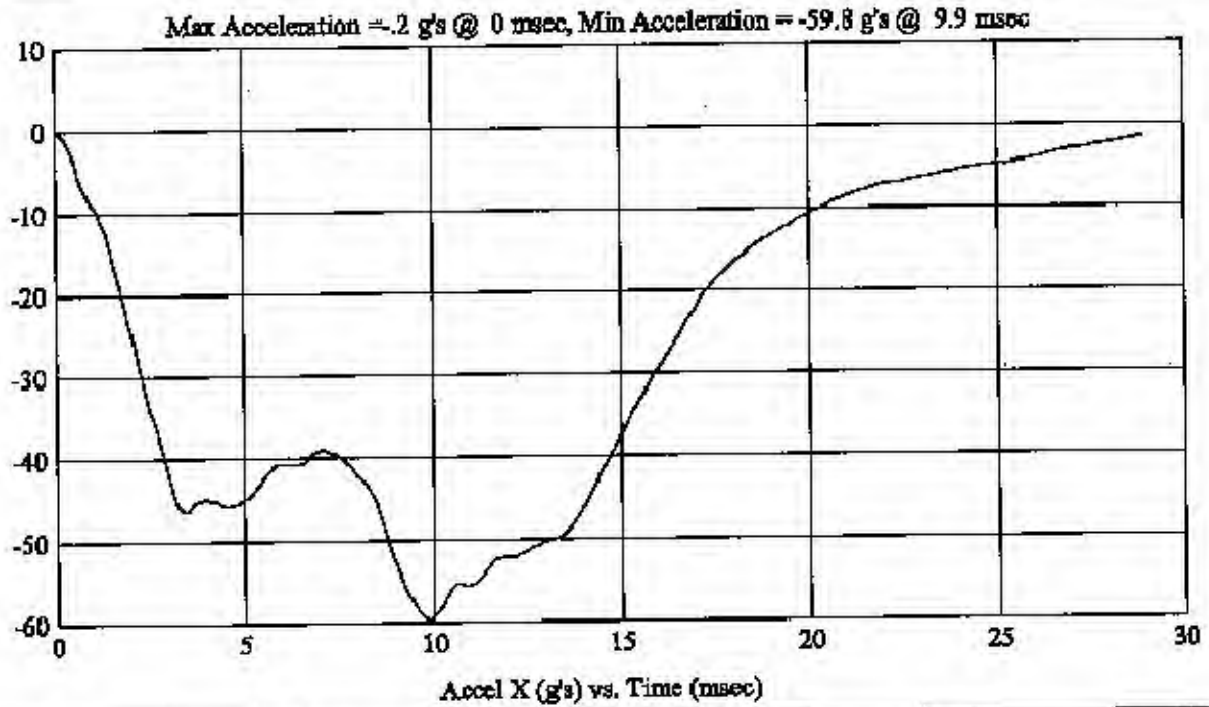


Customer: Subaru  
Test # 7  
FM4716  
Additional Desc: N/A

Vehicle Program: Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP3  
Vehicle Side: Right  
Horz/Vert Angle: 156/45

HIC(d) = 322, HIC = 206, Delta T = 14.2 msec

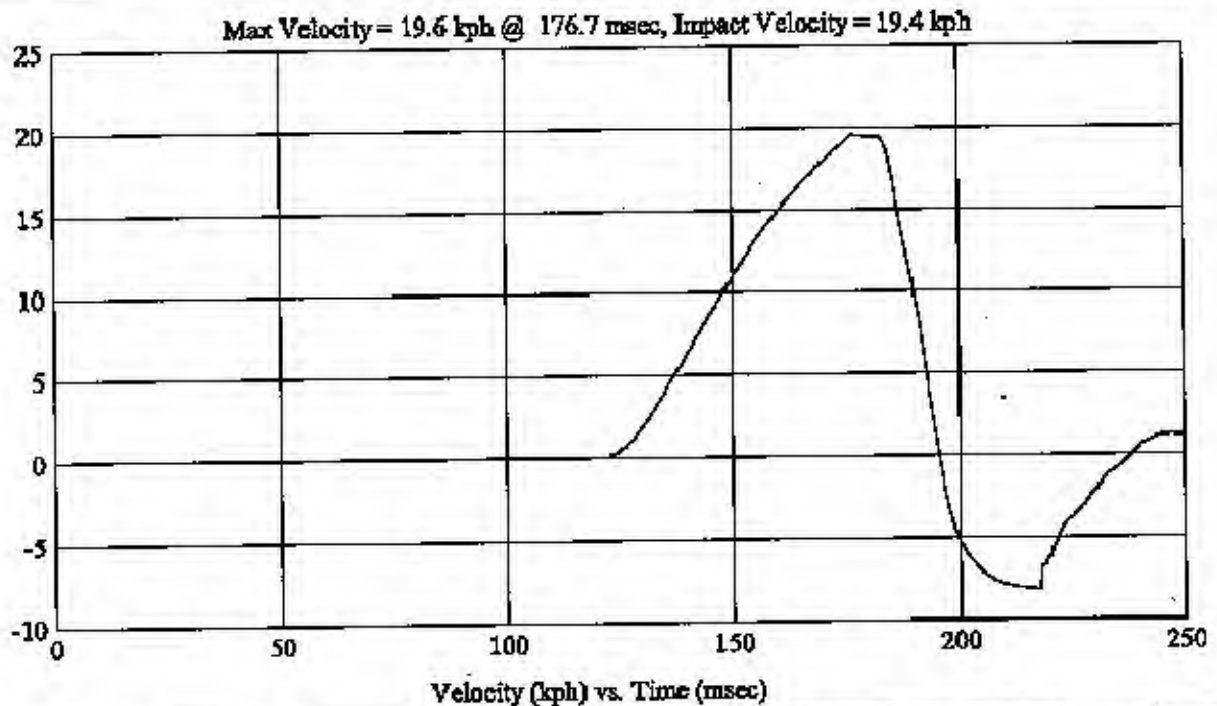
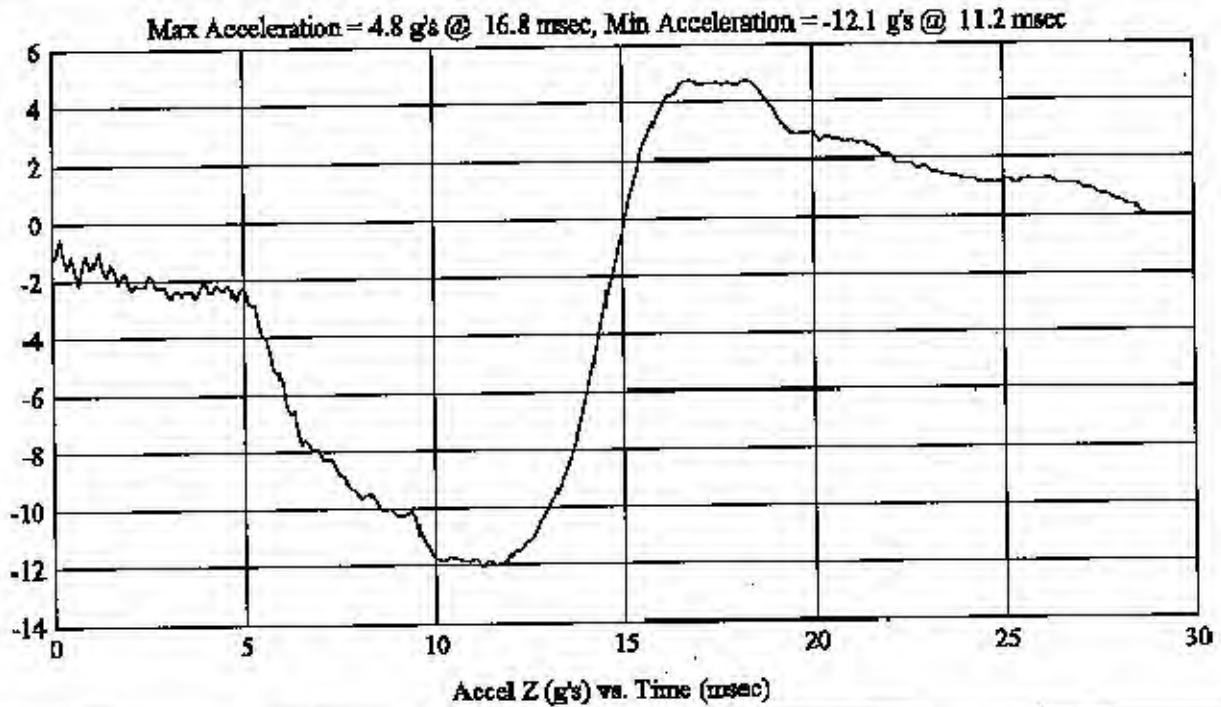


Customer: Subaru  
Test # 7  
FM4716  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: AP3  
Vehicle Side: Right  
Horz/Vert Angle: 156/45

HIC(d) = 322, HIC = 206, Delta T = 14.2 msec



FMH  
G0517-001.2

3-24

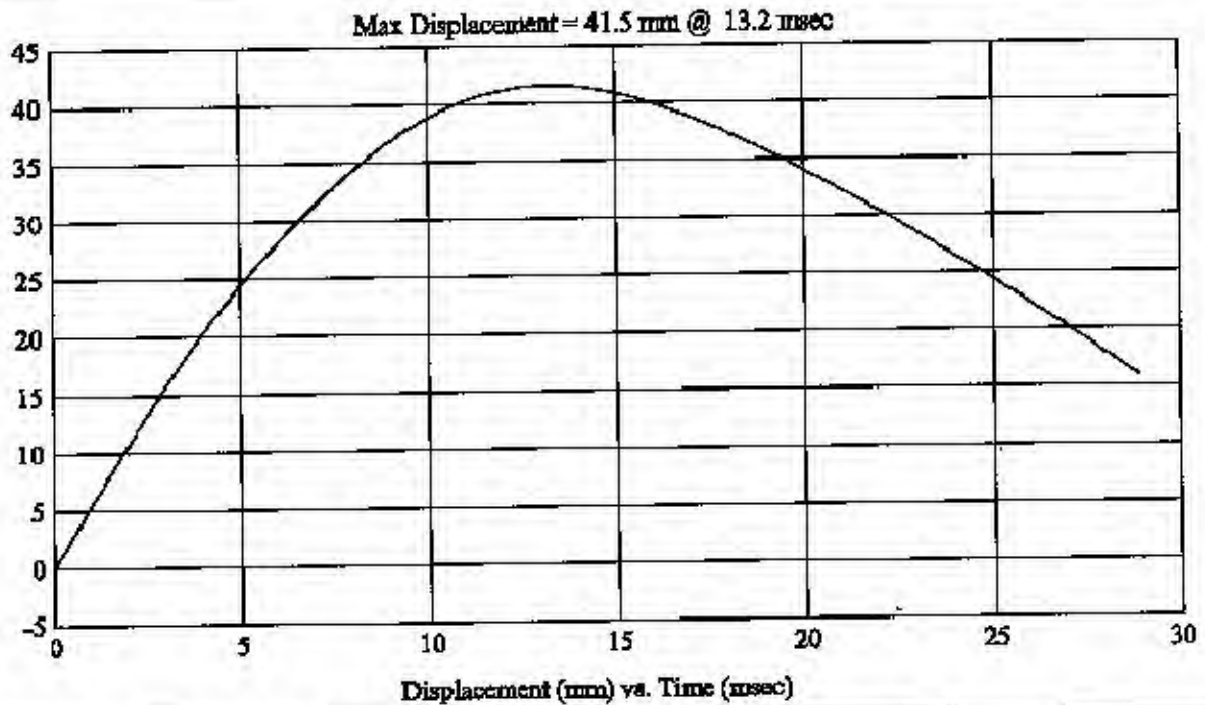
Customer: Subaru  
Test # 7  
FM4716  
Additional Desc: N/A

Vehicle Program : Outback

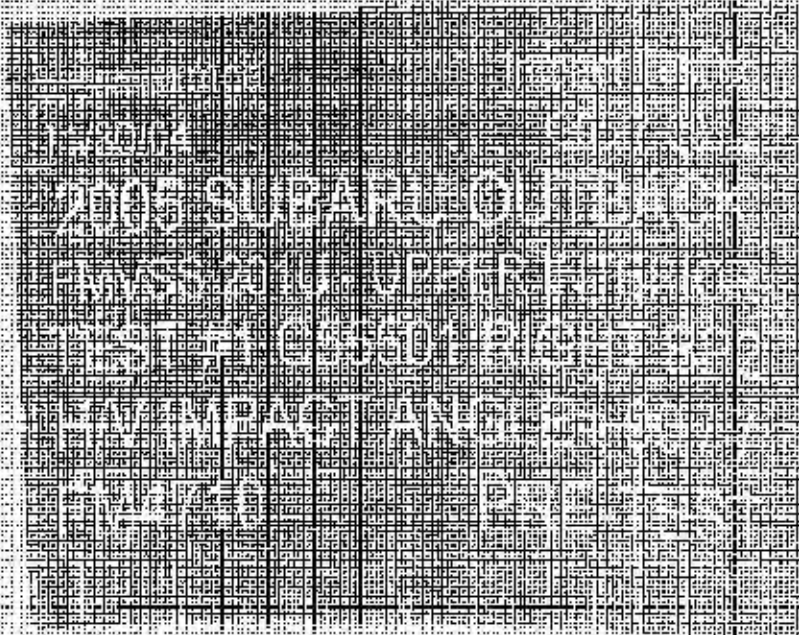
Test Date: 12/1/04

Model Year: 2005  
Target: AP3  
Vehicle Side: Right  
Horiz/Vert Angle: 156/45

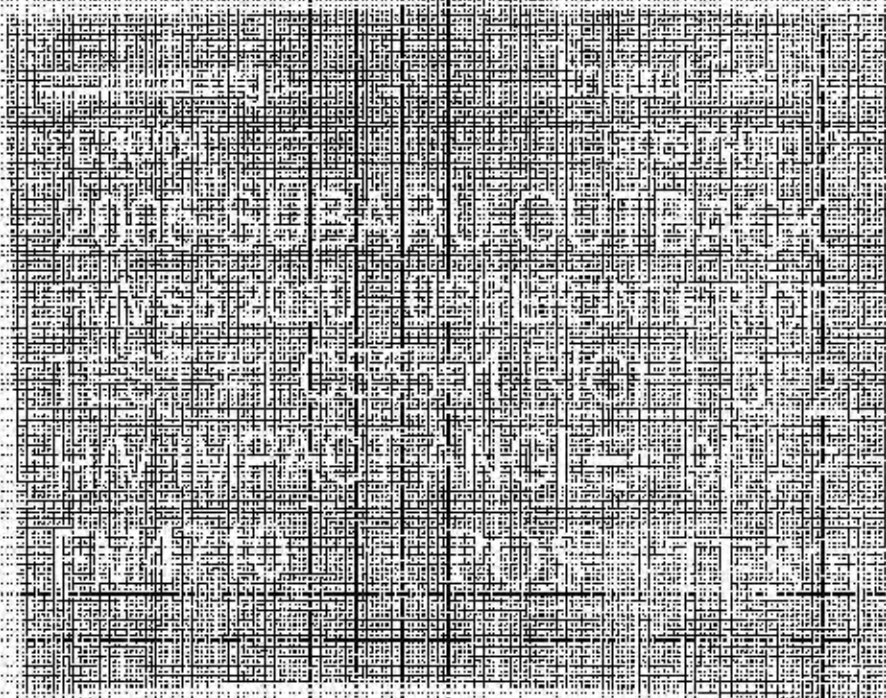
HIC(d) = 322, HIC = 206, Delta T = 14.2 msec



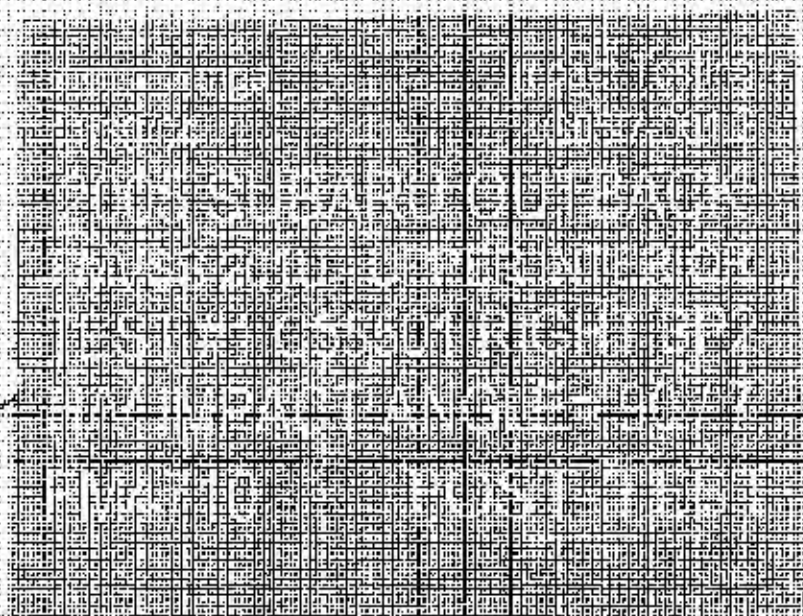












MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
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### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): BP2 Right

MGA Test Reference No.: FMH710

Approach Horizontal Angles: 90°

Approach Vertical Angles: 7°

Additional Description:

Test Number: #1

Temperature: 22C

Humidity: 31%

Time of Test: 12:00 PM

FMH Serial No: 035

#### TEST RESULTS:

HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
635	621	9.3	23.6	10	20 L

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35924	-94.1	1.44	1.43
Y	6	J35919	94.3	1.54	1.54
Z	7	J22664	92.7	1.17	1.15

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By:  Approved By:  Date: 11/30/04

\*Only necessary for NHTSA (Government) Compliance testing.



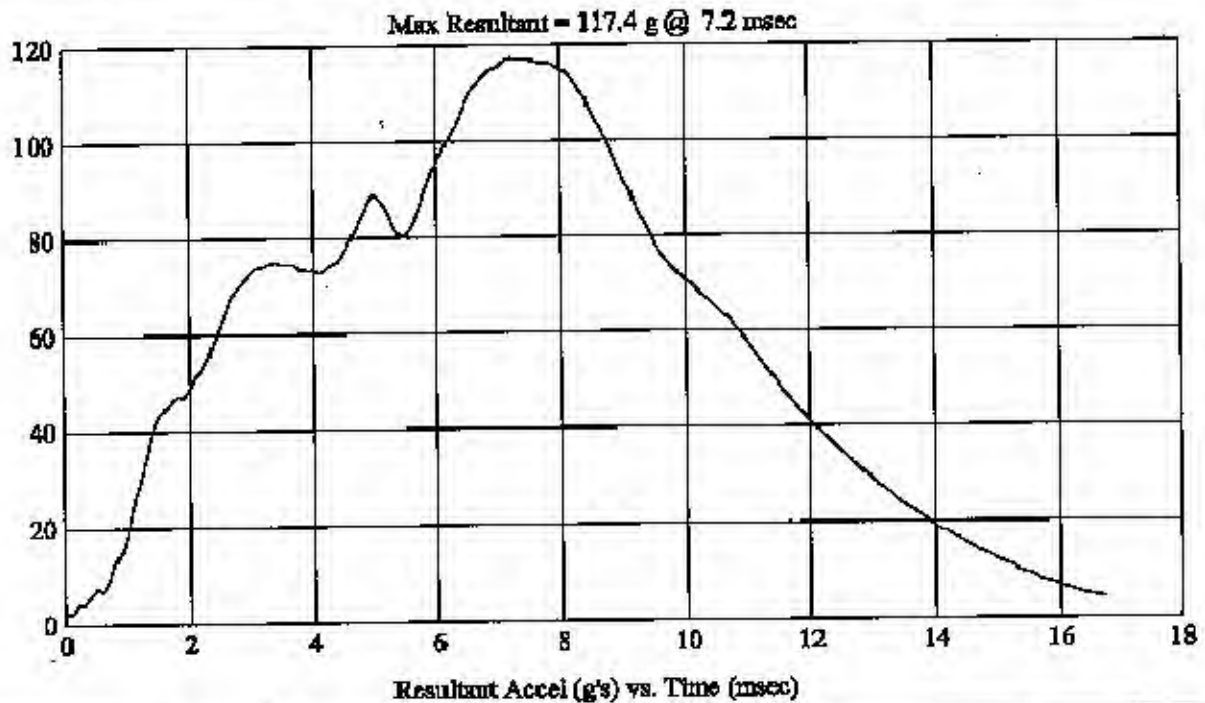
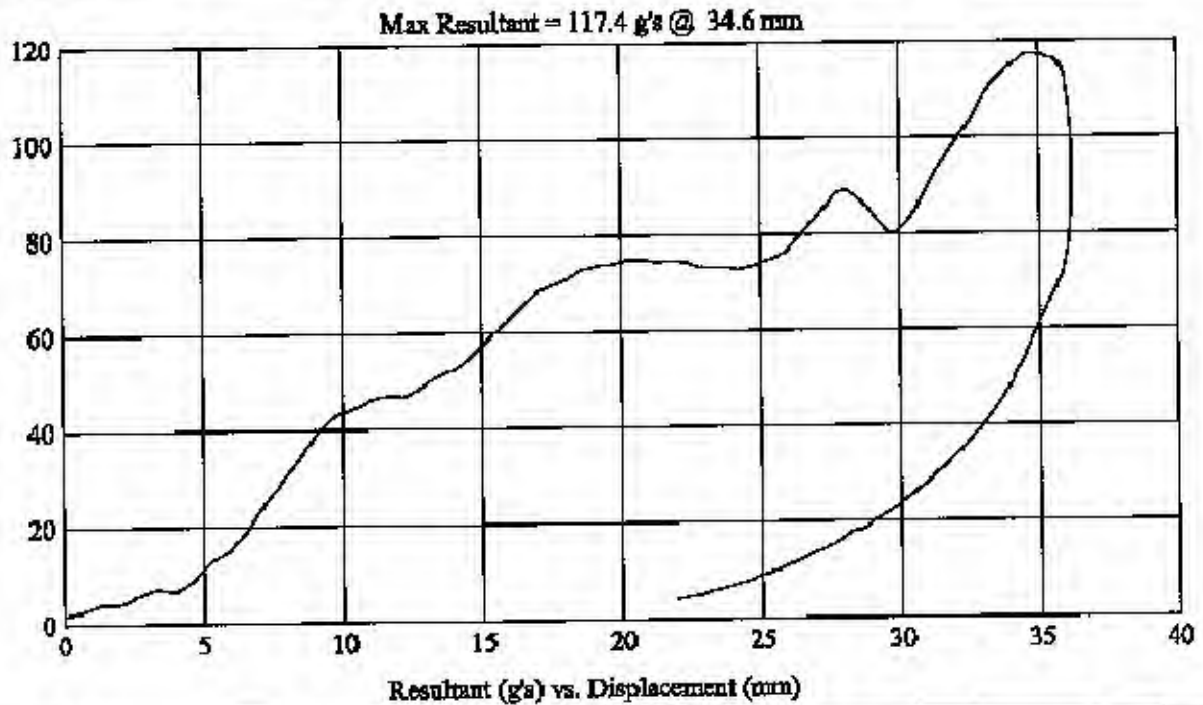
Customer: Subaru  
Test # 1  
FM4710  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: BP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/7

HIC(d) = 635, HIC = 621, Delta T = 9.3 msec



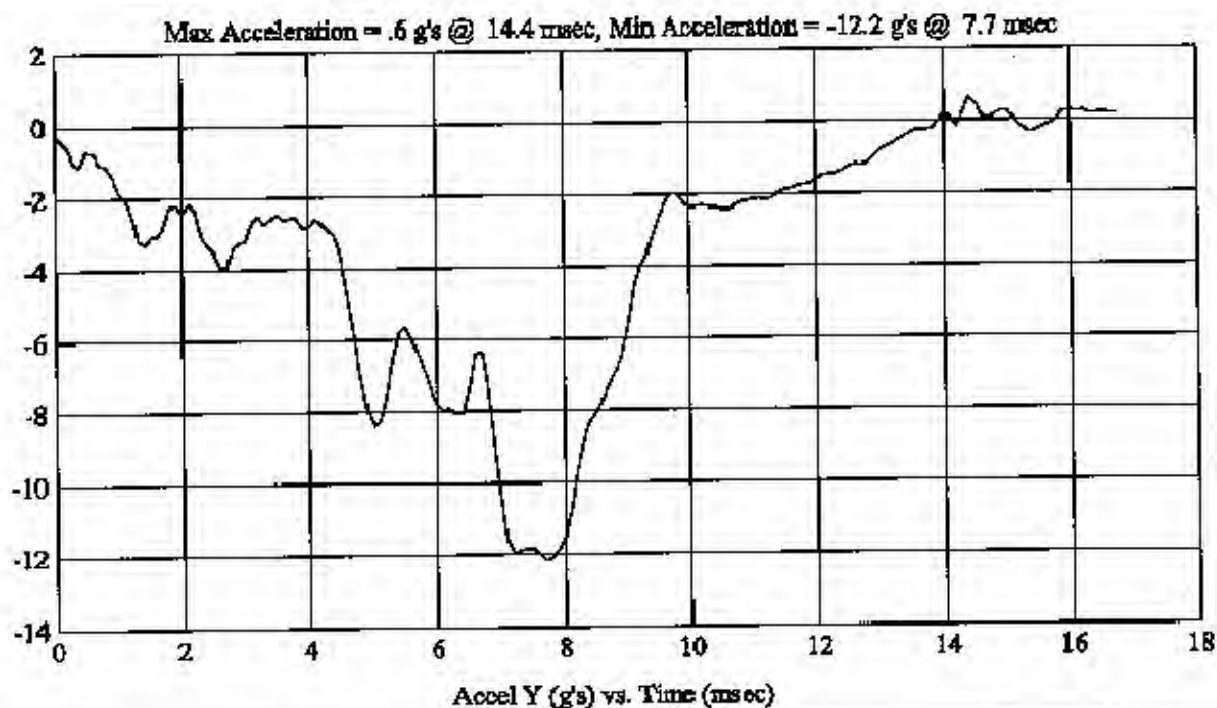
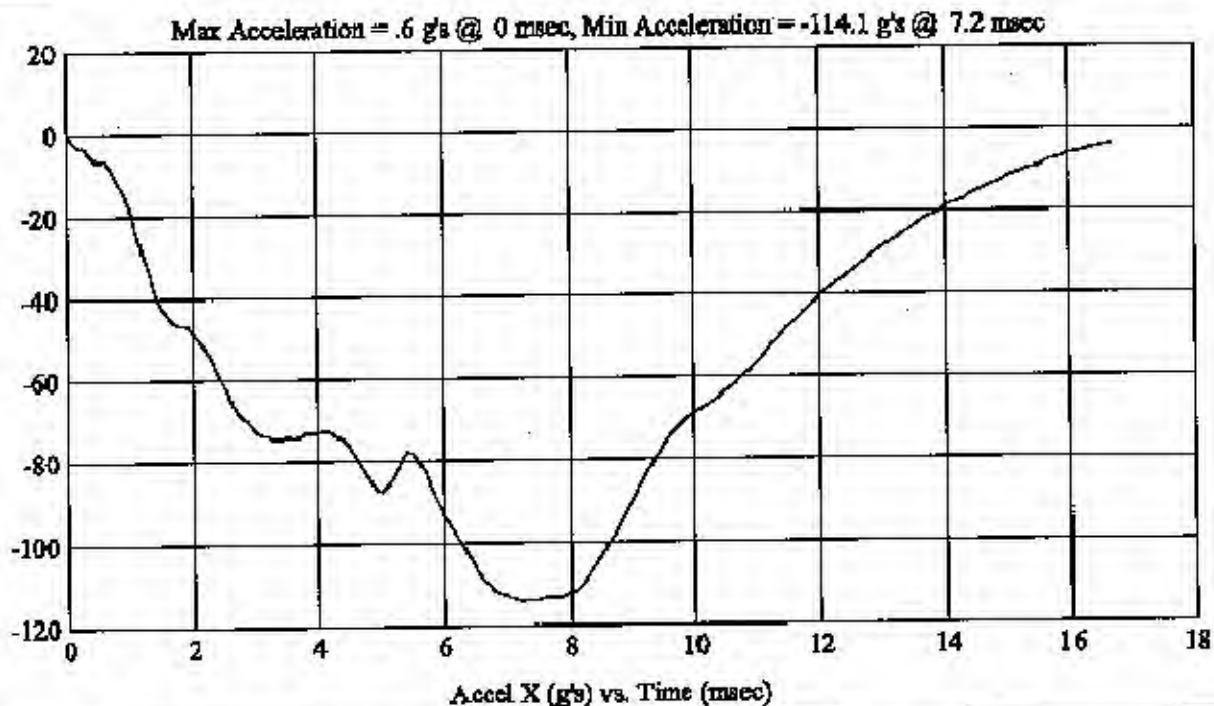
Customer: Subaru  
Test # 1  
FM4710  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: BP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/7

HIC(d) = 635, HIC = 621, Delta T = 9.3 msec



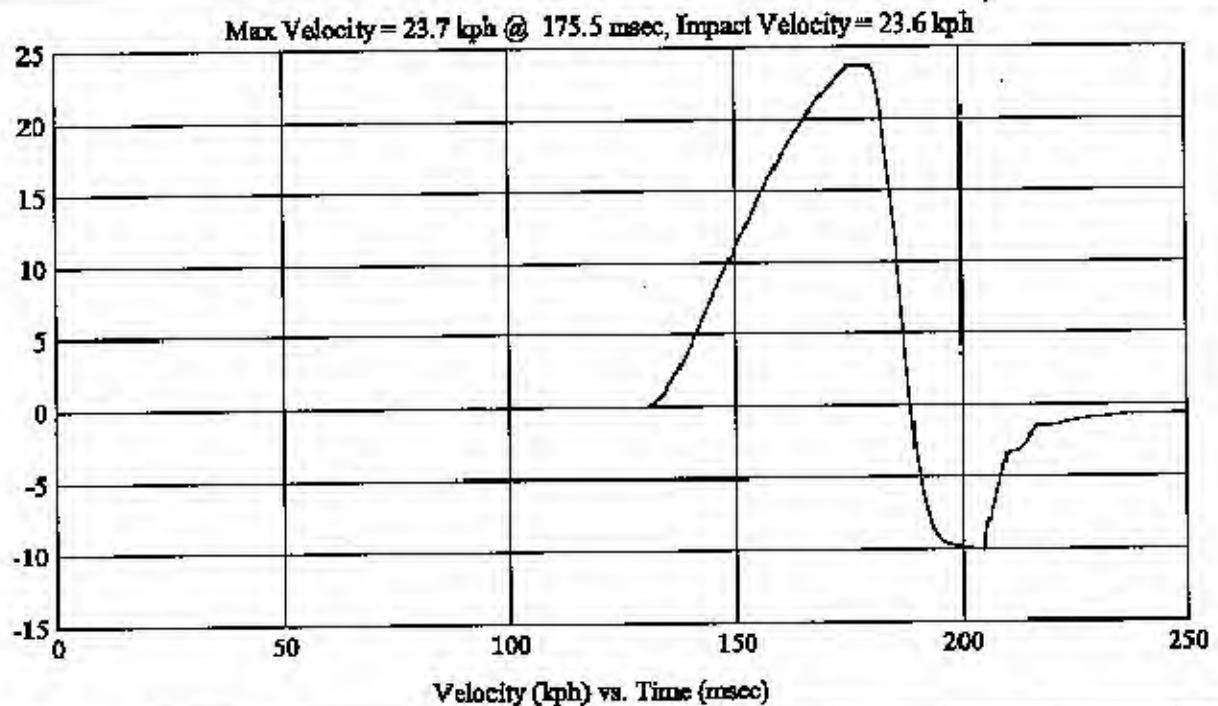
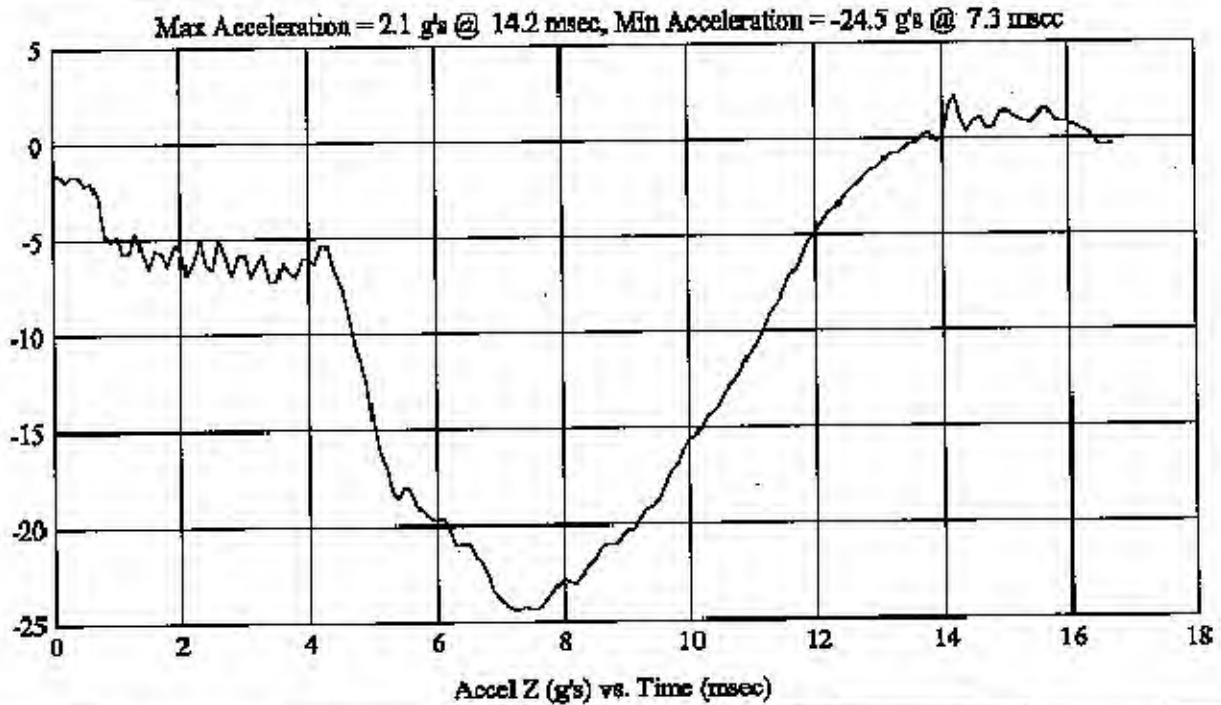
Customer: Subaru  
Test # 1  
FM4710  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: BP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/7

HIC(d) = 635, HIC = 621, Delta T = 9.3 msec



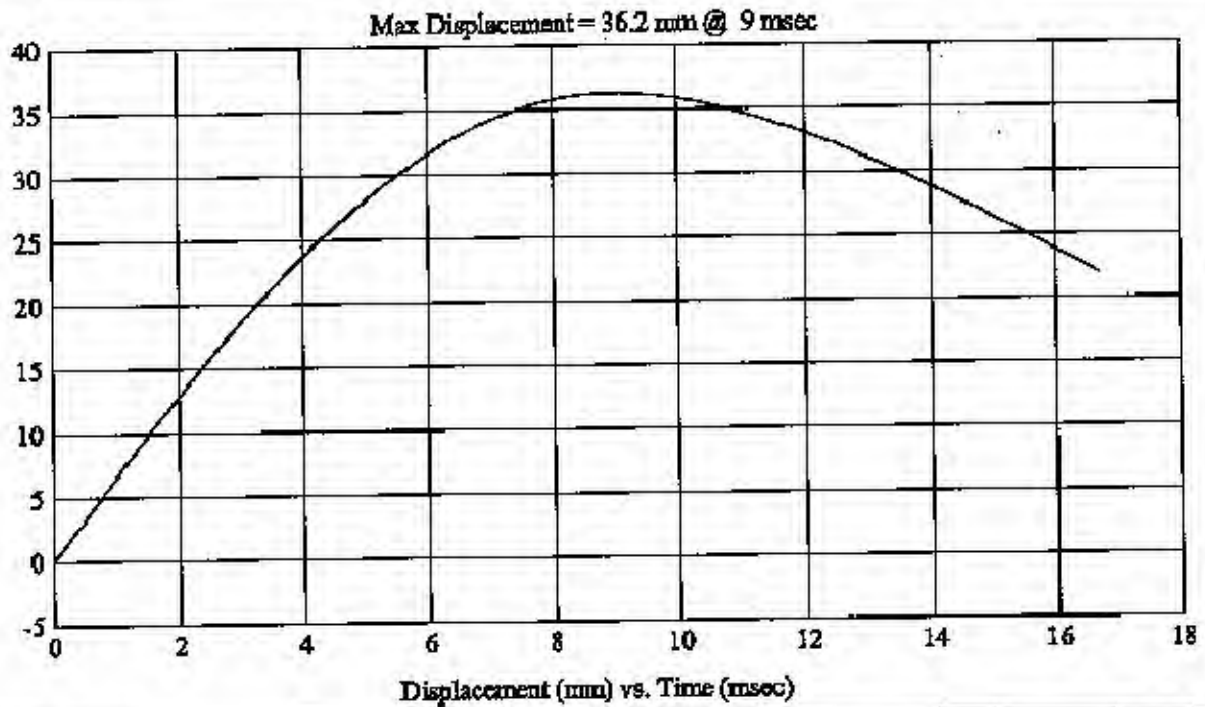
Customer: Subaru  
Test # 1  
FM4710  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: BP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/7

HIC(d) = 635, HIC = 621, Delta T = 9.3 msec









mgc

12/1/04

Impact Testing

C0557001.2

2005 SUBARU OUTBACK

HVSS 201U - UPPER INTERIOR

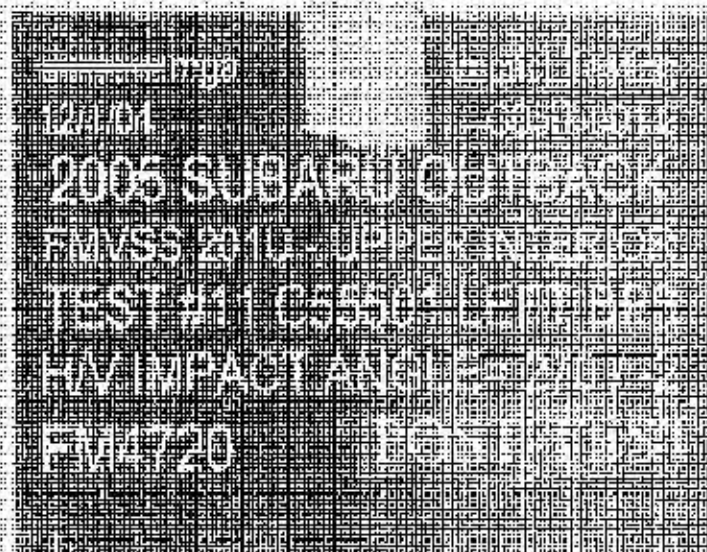
TEST #11 C55501 LEFT EP3

IMPACT ANGLE = 270° ± 7°

C04720

BOLT TEST





MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): BP3 Left

MGA Test Reference No.: FM4720

Approach Horizontal Angles: 270°

Approach Vertical Angles: -2°

Additional Description:

Test Number: #11

Temperature: 21°C

Humidity: 25%

Time of Test: 4:32 PM

FMH Serial No: 035

#### TEST RESULTS:

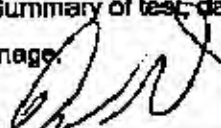
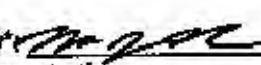
HIC(d)	HIC	At (maec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
584	567	9.3	23.6	20	37 L

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	94.1	1.44	1.44
Y	6	J35919	94.3	1.54	1.54
Z	7	J22664	92.7	1.18	1.18

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By:  Approved By:  Date: 12/1/04

\*Only necessary for NHTSA (Government) Compliance testing.

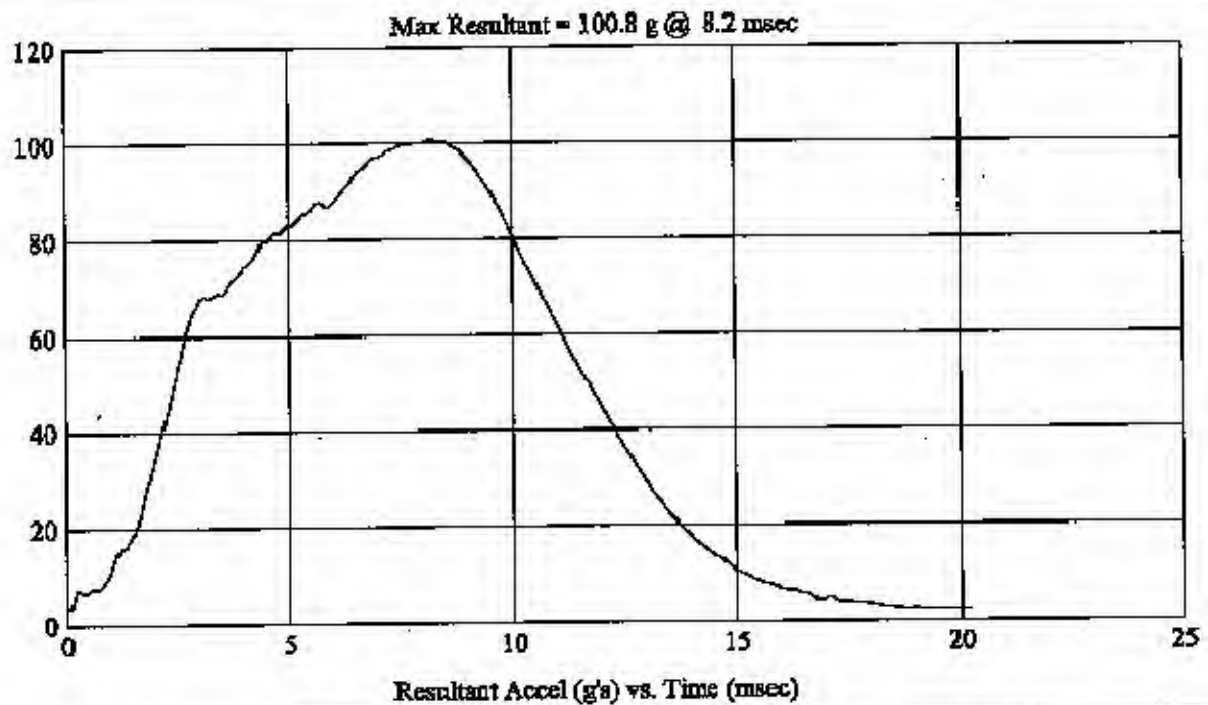
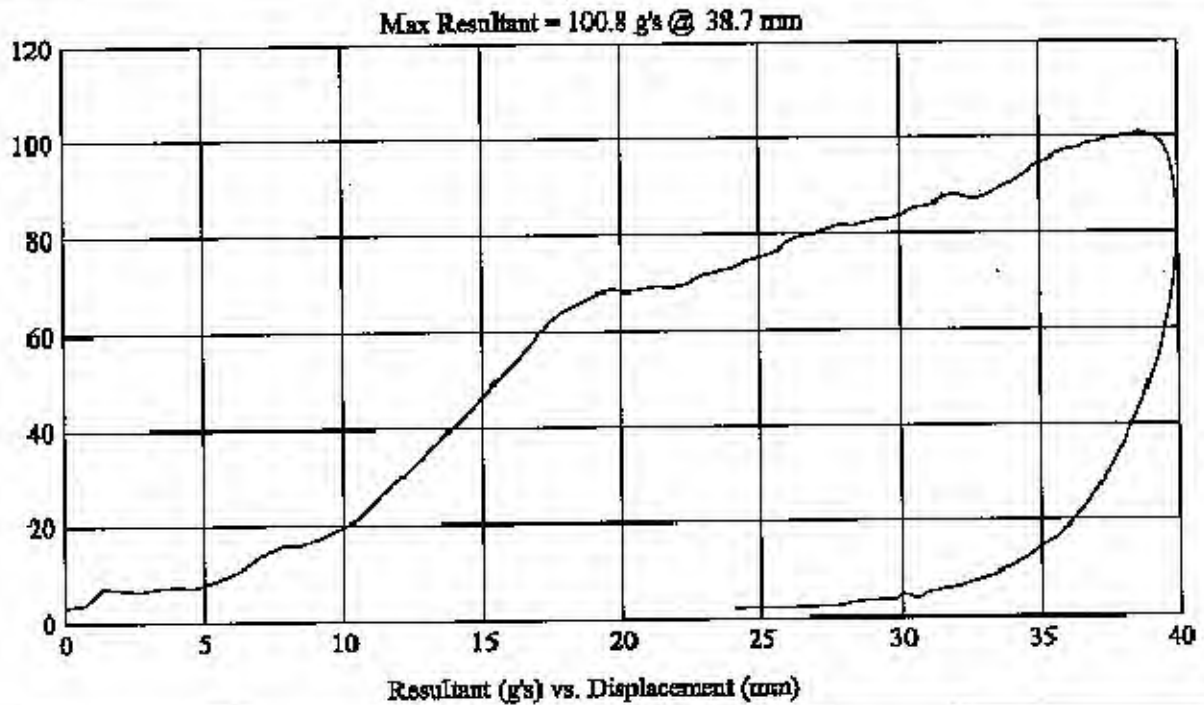


Customer: Subaru  
Test # 11  
FM4720  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 12/1/04

Model Year: 2005  
Target: BP3  
Vehicle Side: Left  
Horz/Vert Angle: 270/-2

HIC(d) = 594, HIC = 567, Delta T = 9.3 msec



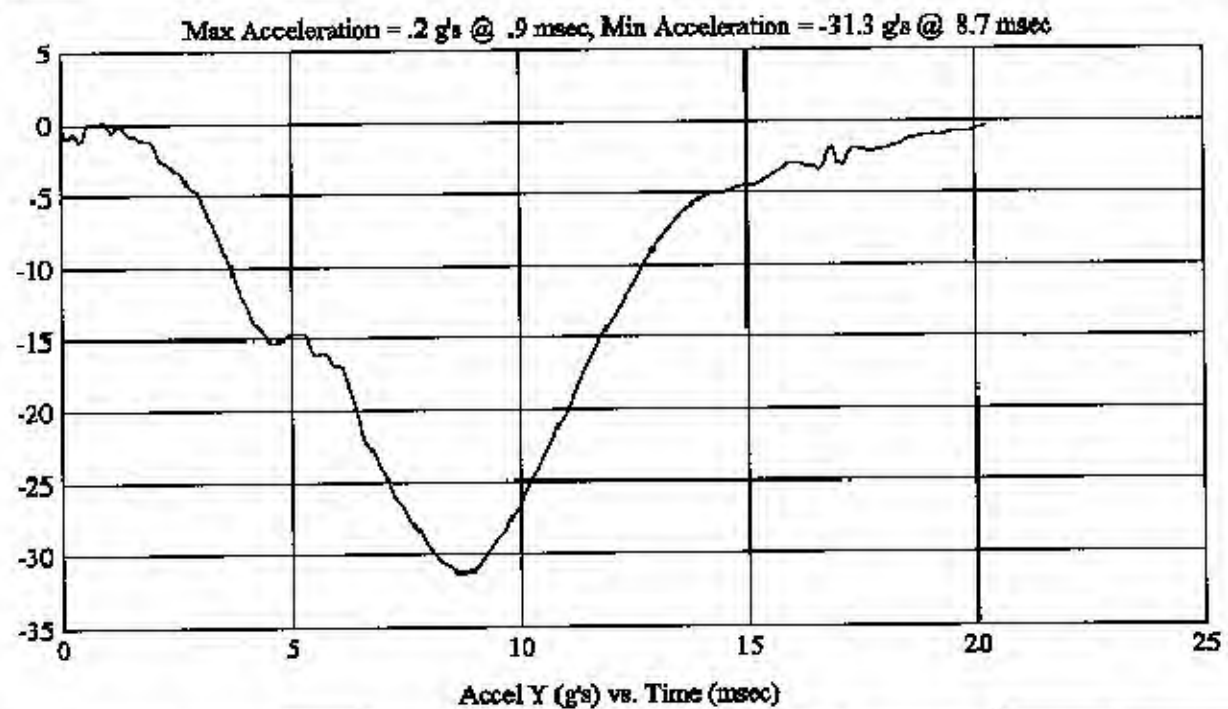
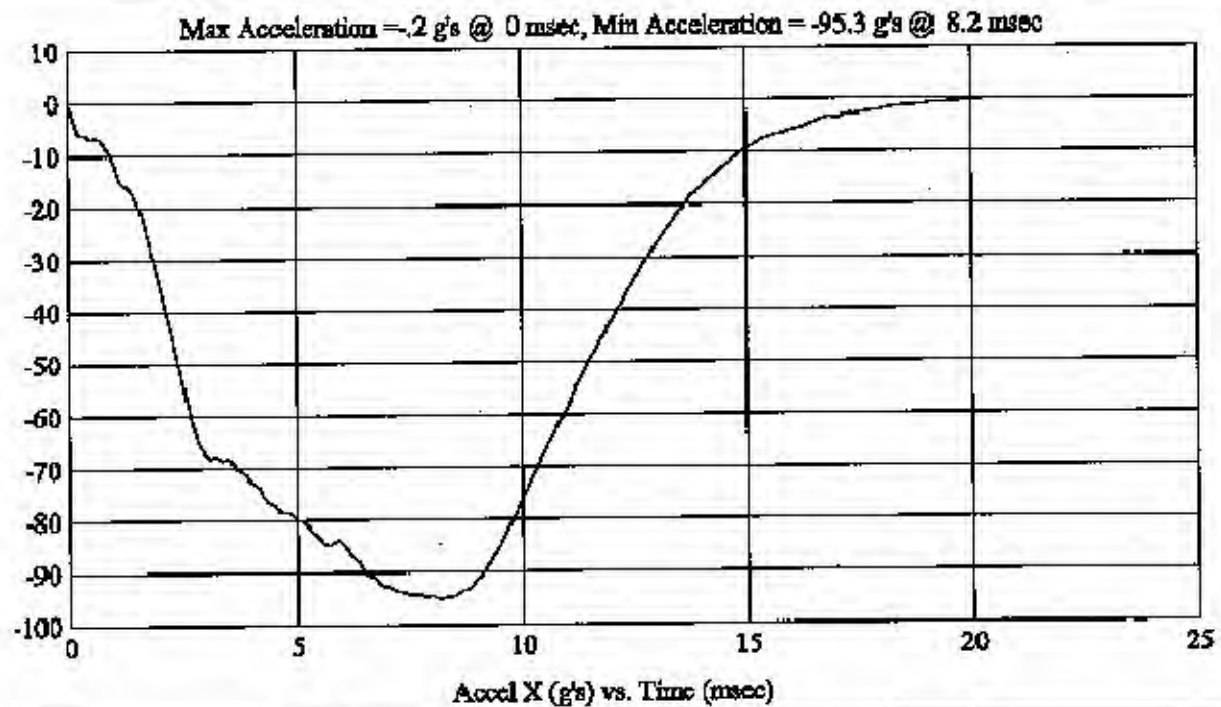
Customer: Subaru  
Test # 11  
FM4720  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: BP3  
Vehicle Side: Left  
Horz/Vert Angle: 270/-2

HIC(d) = 594, HIC = 567, Delta T = 9.3 msec



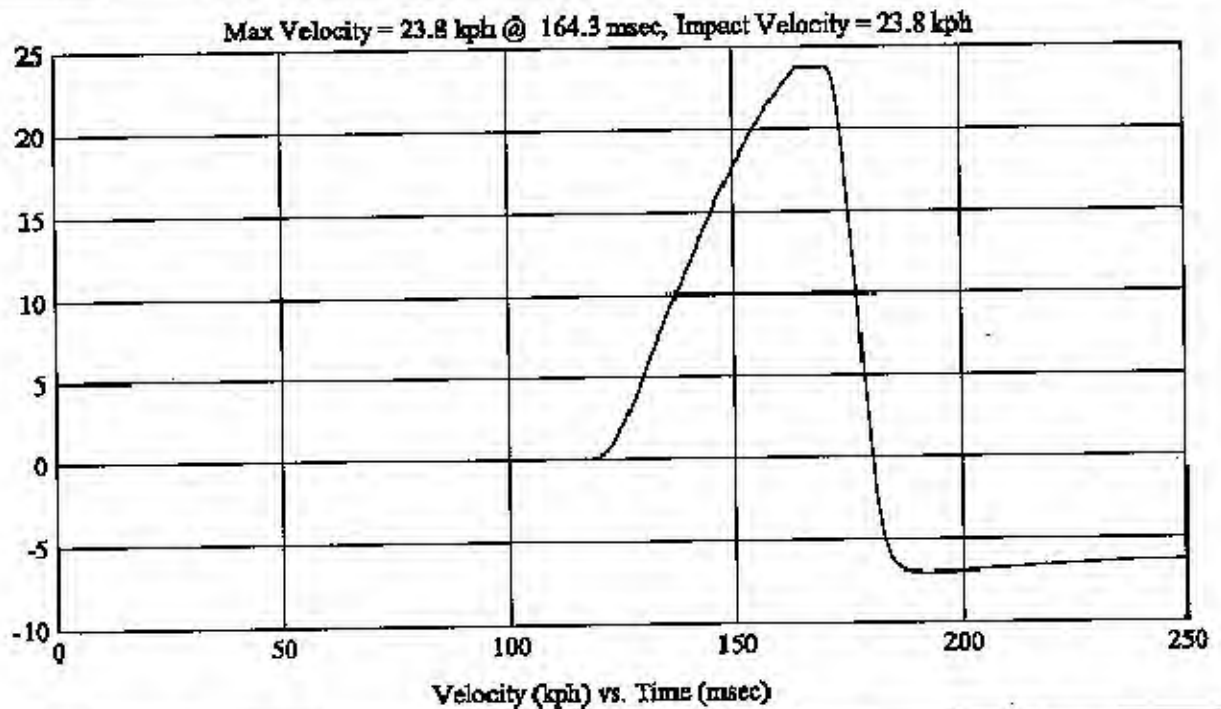
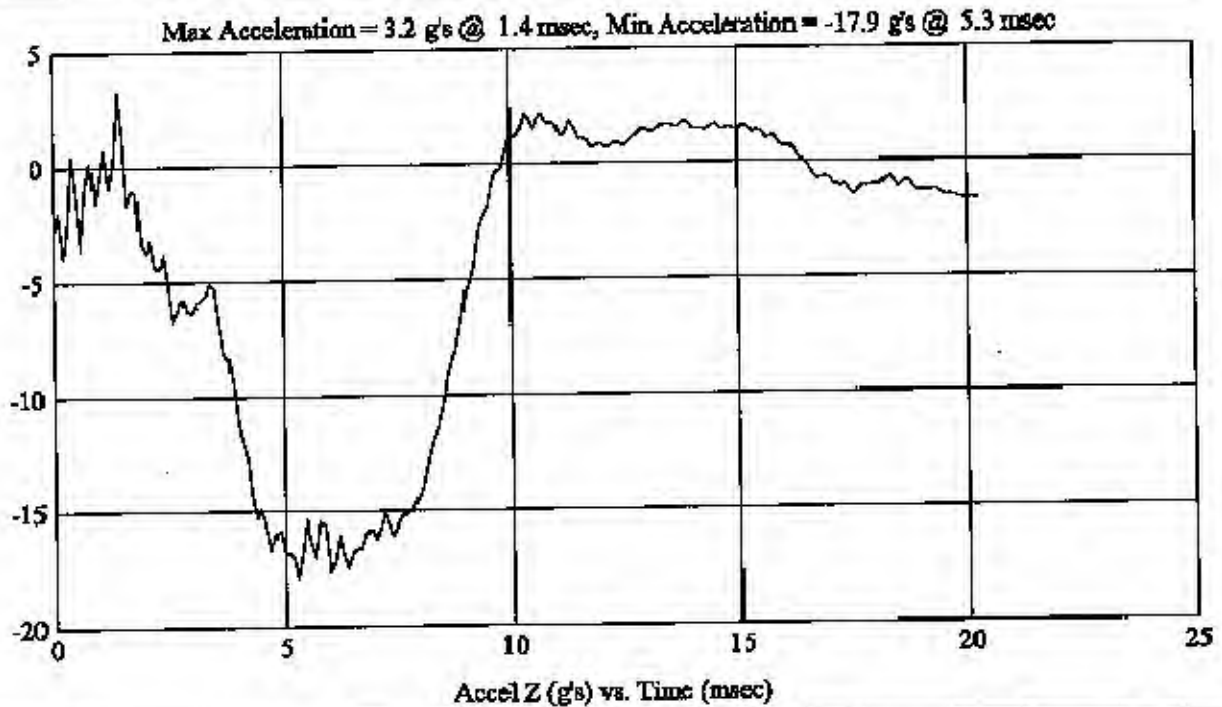
Customer: Subaru  
Test # 11  
FM4720  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: BP3  
Vehicle Side: Left  
Horz/Vert Angle: 270/-2

HIC(d) = 594, HIC = 567, Delta T = 9.3 msec



FMH  
G0517-001.2

3-40

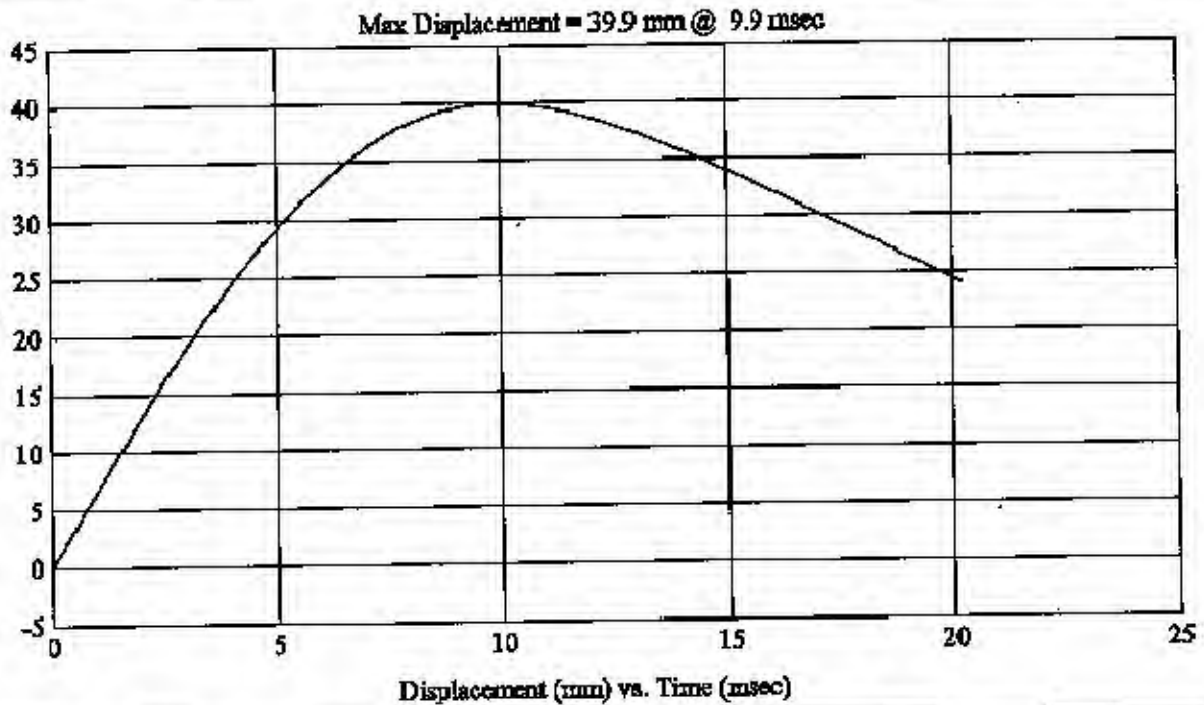
Customer: Subaru  
Test # 11  
FM4720  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: BP3  
Vehicle Side: Left  
Horz/Vert Angle: 270/-2

HIC(d) = 594, HIC = 567, Delta T = 9.3 msec





MGA

Impact Testing

1/30/04

G0317-0012

2005 SUBARU OUTBACK

NADSS 2014 - UPPER INTERIOR

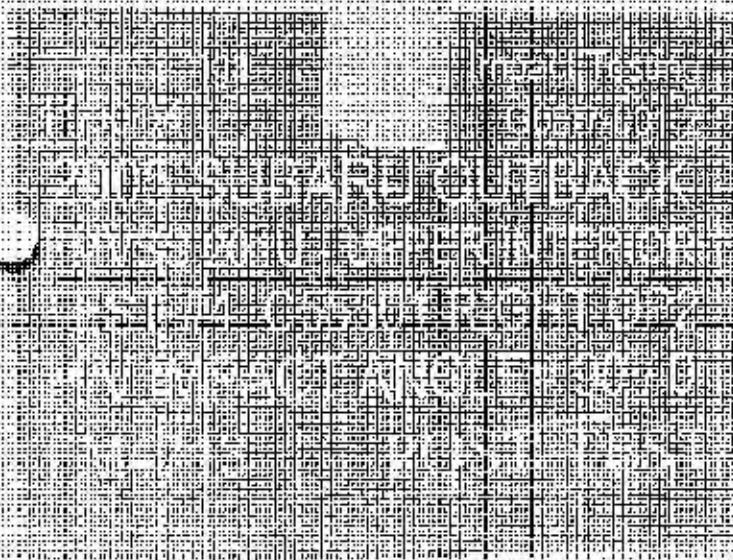
TEST 44 C55501 RIGHT OR2

IMPACT ANGLE = 90/0

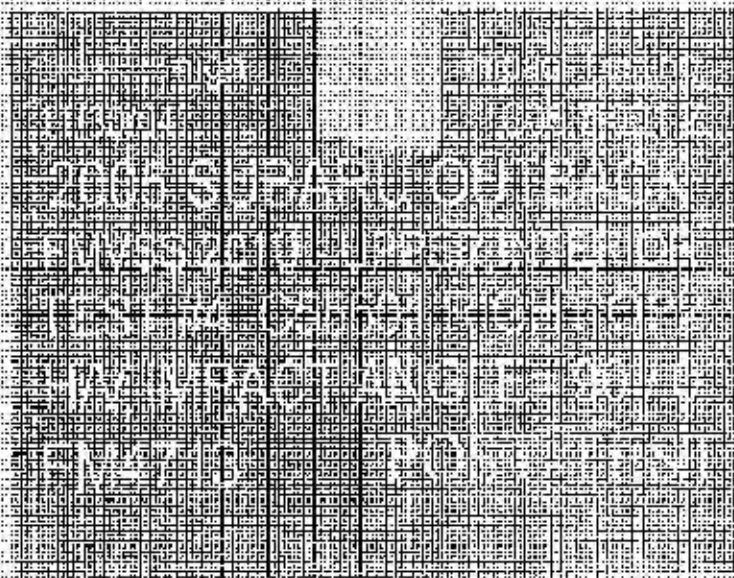
IMPACTOR = 2.0 LB

IMPACTOR = 2.0 LB









MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP20721Q.2

DOC. NO.: MGATP20721Q.3  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): OP2 Right

MGA Test Reference No.: FM4713

Approach Horizontal Angles: 90°

Approach Vertical Angles: 0°

Additional Description:

Test Number: #4

Temperature: 22C

Humidity: 31%

Time of Test: 3:36 PM

FMH Serial No: 038

#### TEST RESULTS:

HIC(d)	HIC	At (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
608	587	7.1	23.8	22	3 R

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-110	1.44	1.44
Y	6	J36193	101.9	1.54	1.54
Z	7	J36353	86.7	1.17	1.48

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By:  Approved By:  Date: 11/30/04

\*Only necessary for NHTSA (Government) Compliance testing.



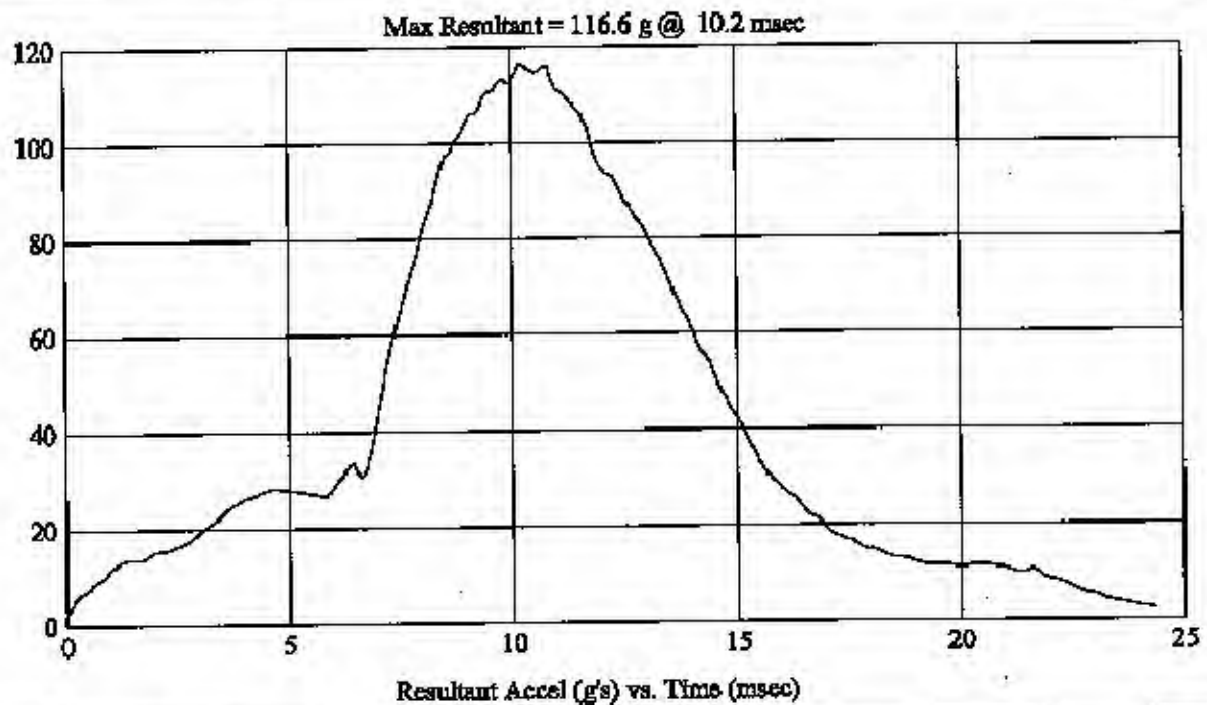
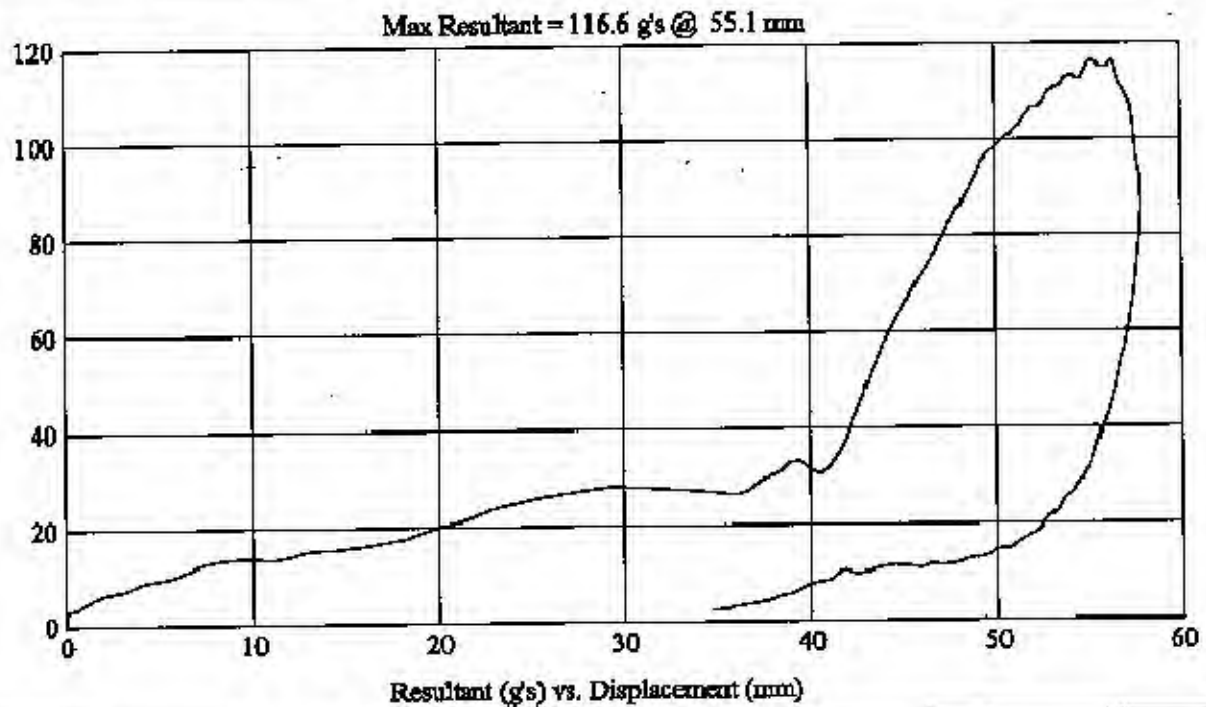
Customer: Subaru  
Test # 4  
FM4713  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: OP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/0

HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

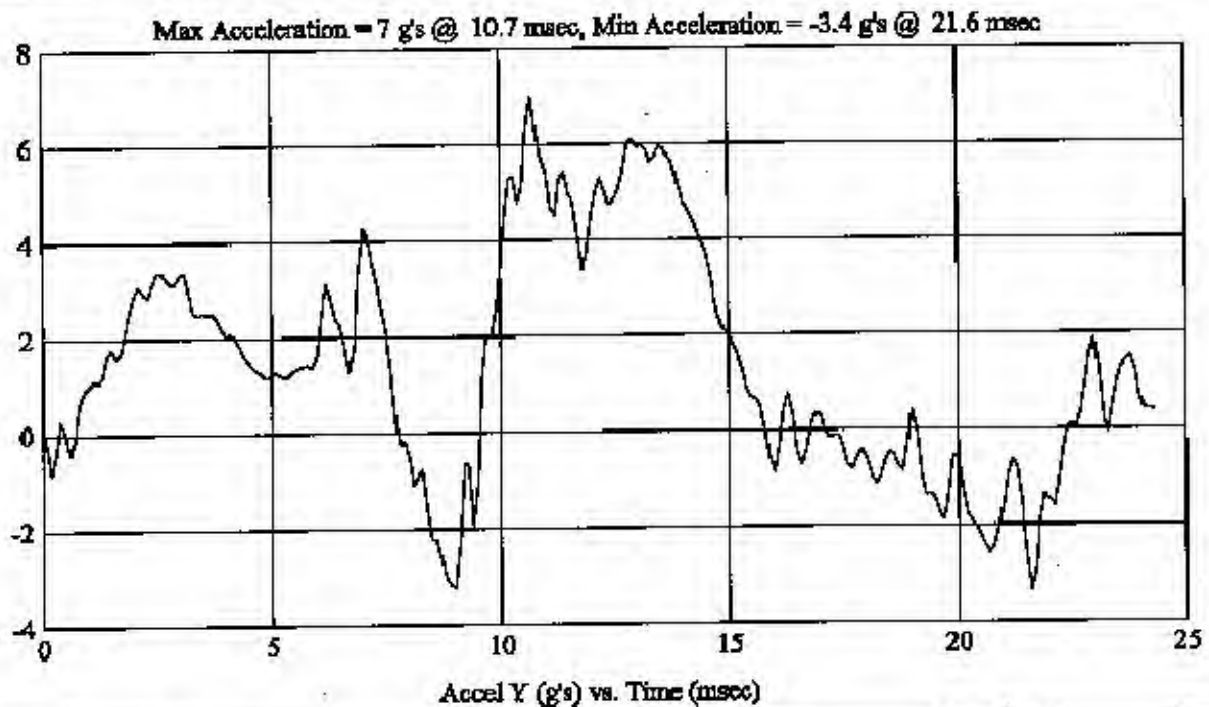
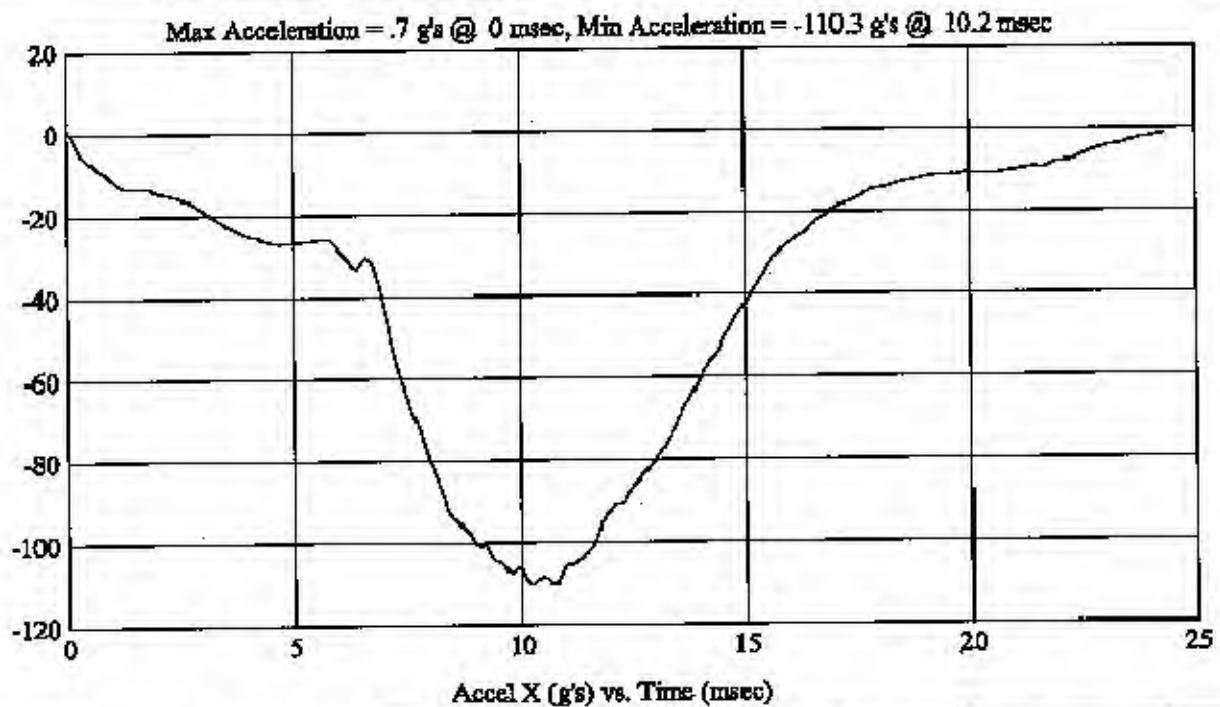


Customer: Subaru  
Test # 4  
FM4713  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 11/30/04

Model Year: 2005  
Target: OP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/0

HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

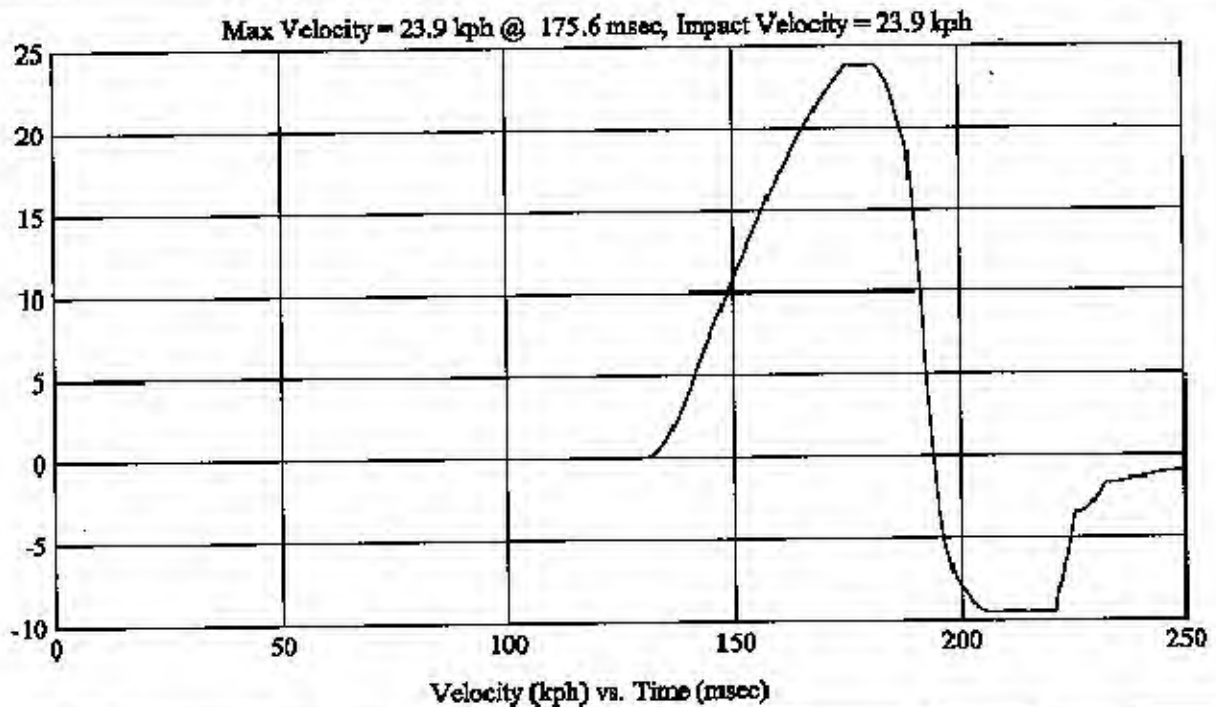
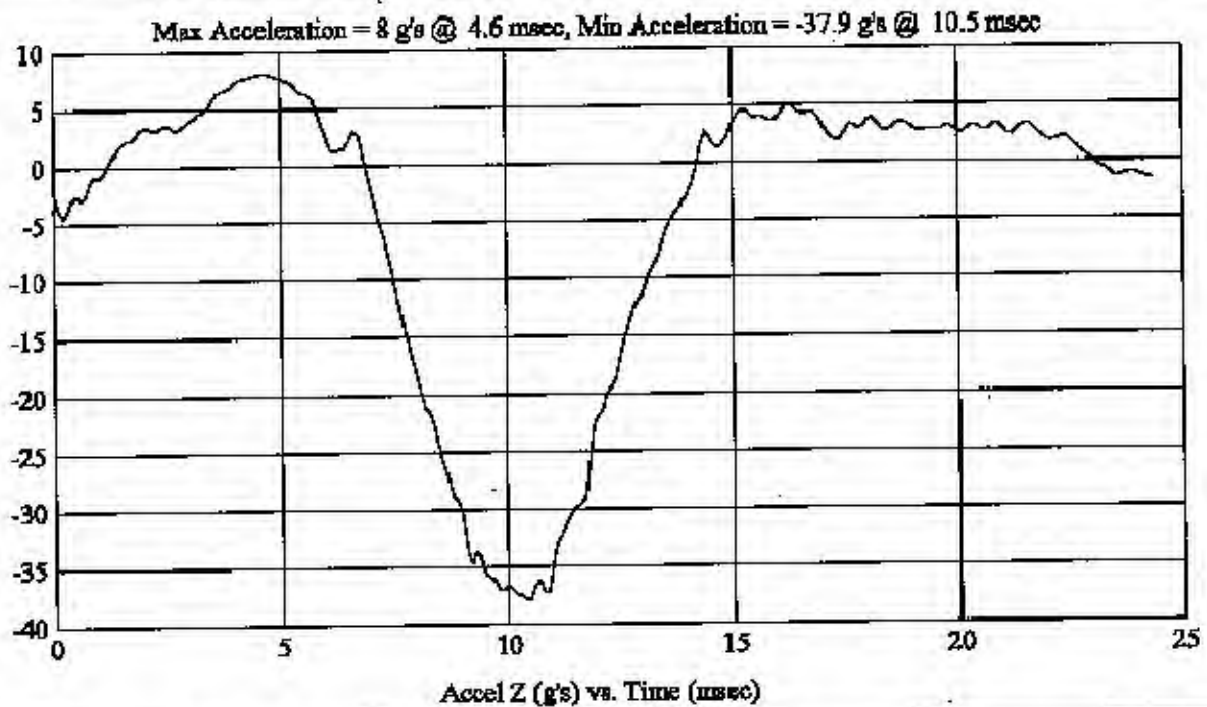


Customer: Subaru  
Test # 4  
FM4713  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 11/30/04

Model Year: 2005  
Target: OP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/0

HIC(d) = 609, HIC = 587, Delta T = 7.1 msec



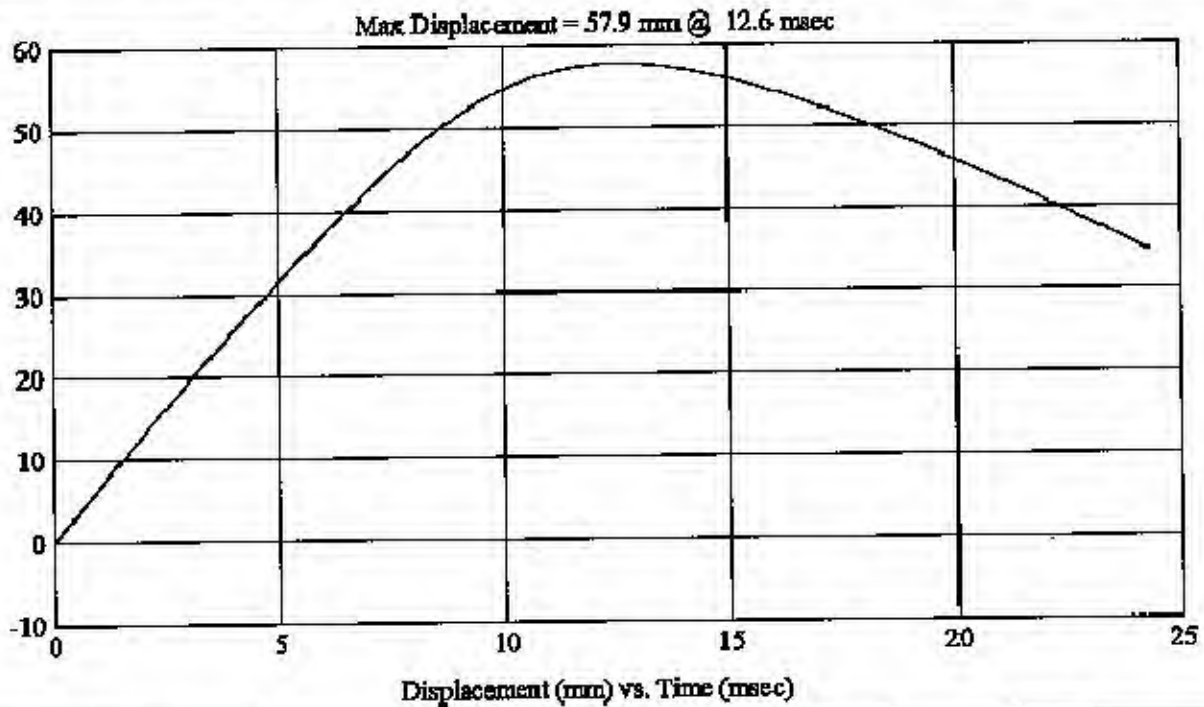
Customer: Subaru  
Test # 4  
FM4713  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: OP2  
Vehicle Side: Right  
Horz/Vert Angle: 90/0

HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

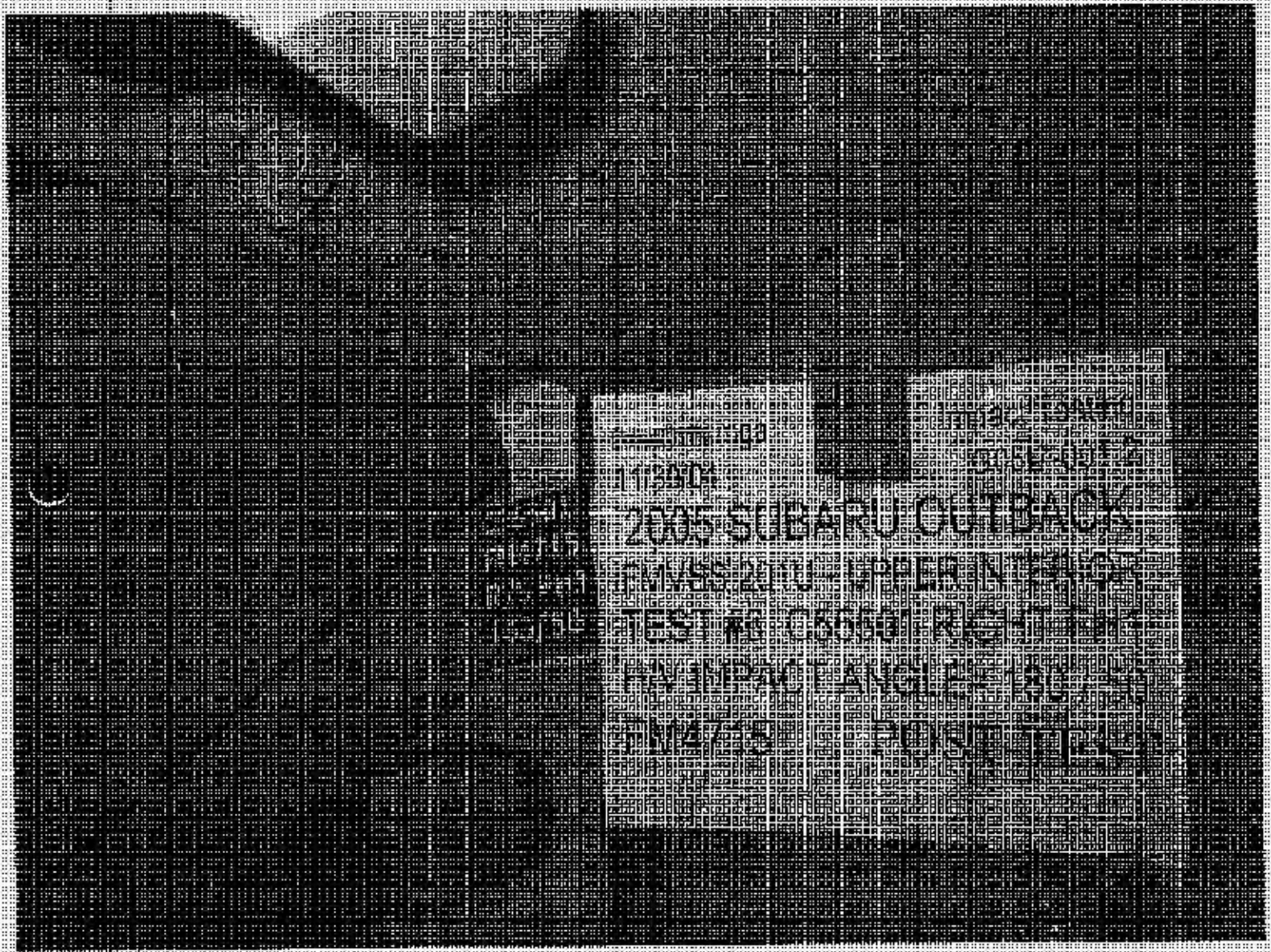




Impact Test  
 C0557 3012

2005 SUBARU OUTBACK  
 PASS 2010 - UPPER INTERIOR  
 TEST 40 C55501 RIGHT FH1  
 IMPACT ANGLE = 180 DEG  
 PRE-TEST

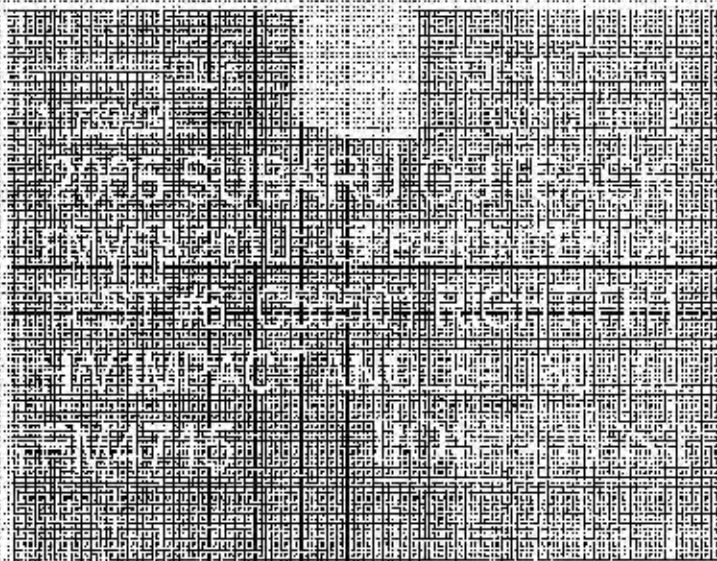




2005 SUBARU OUTBACK

MASS AND EFFICIENT  
TEST RECORDS  
WEATHER AND  
MAJOR FOR THE





MICHIGAN OPERATIONS  
DATE: 2/20/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.2  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): FH1 Right

MGA Test Reference No.: FM4715

Approach Horizontal Angles: 180°

Approach Vertical Angles: 50°

Additional Description:

Test Number: #8

Temperature: 22°C

Humidity: 31%

Time of Test: 5:20 PM

FMH Serial No: 036

#### TEST RESULTS:


HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
770	800	5.4	23.5	11	8 R

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35923	-99.8	1.44	1.44
Y	6	J35916	99.7	1.54	1.54
Z	7	J35918	98.1	1.18	1.17

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: 

Approved By: 

Date: 11/30/04

\*Only necessary for NHTSA (Government) Compliance testing



FMH  
G0517-001.2

3-53

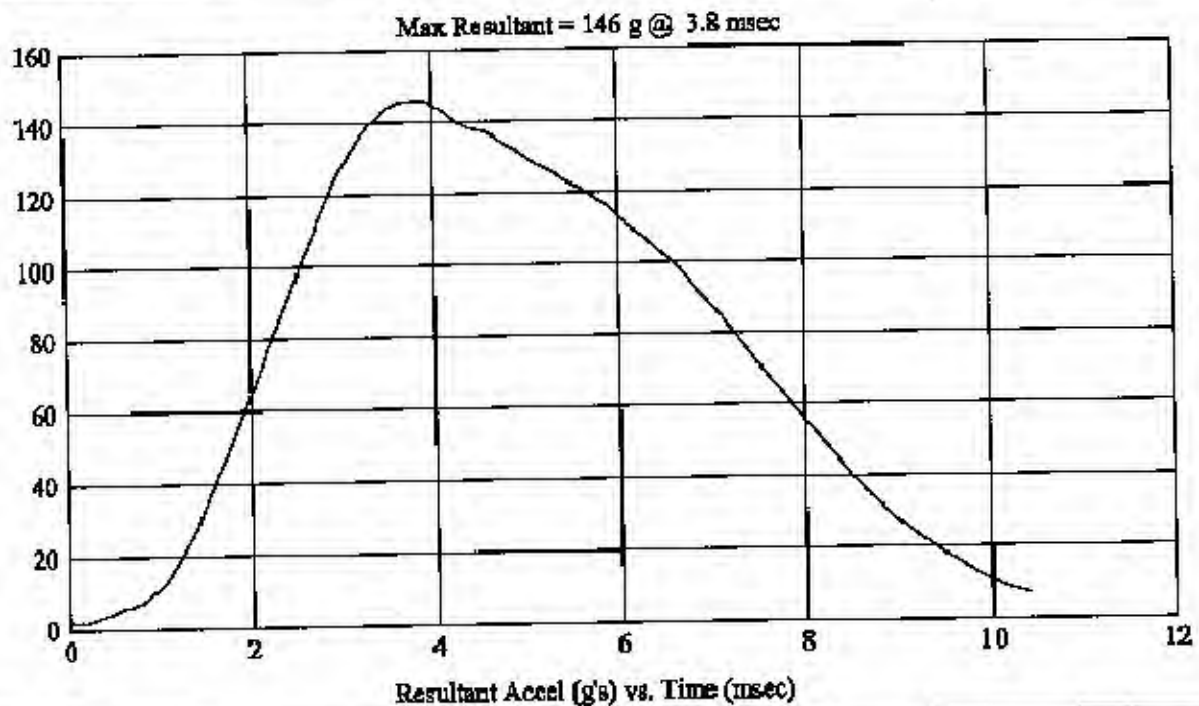
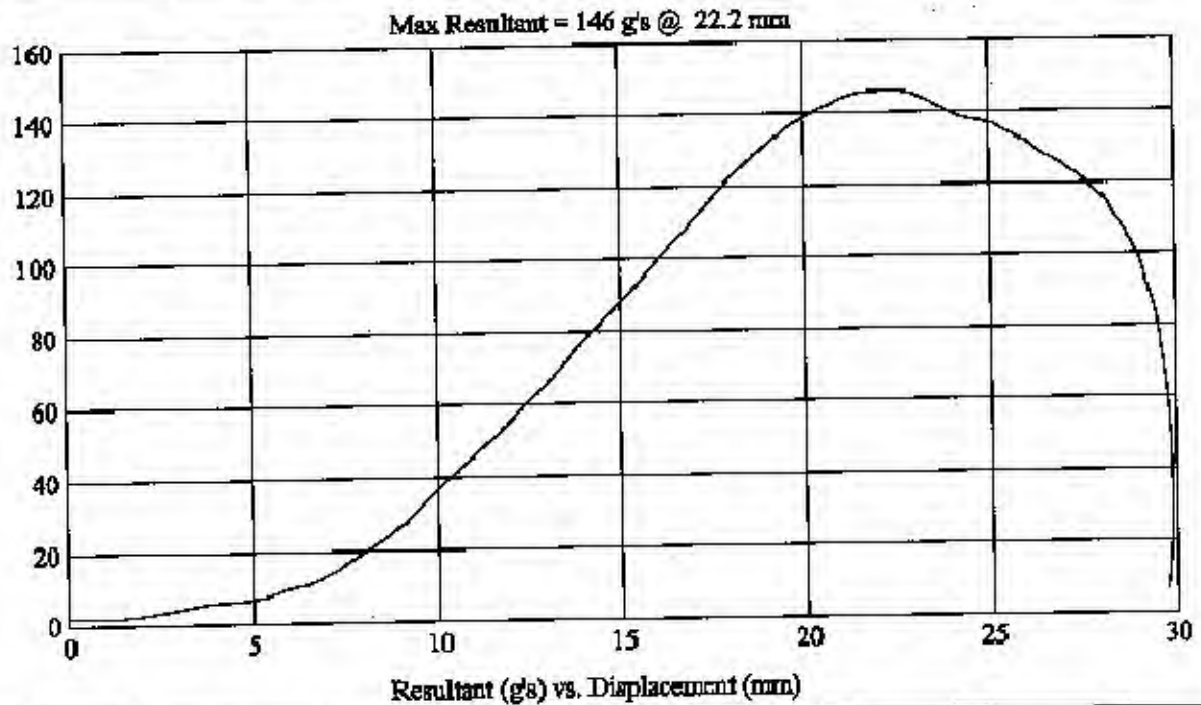
Customer: Subaru  
Test # 6  
FM4715  
Additional Desc: N/A

Vehicle Program: Outback

Test Date: 11/30/04

Model Year: 2005  
Target: FH1  
Vehicle Side: Right  
Horz/Vert Angle: 180/50

HIC(d) = 770, HIC = 800, Delta T = 5.4 msec

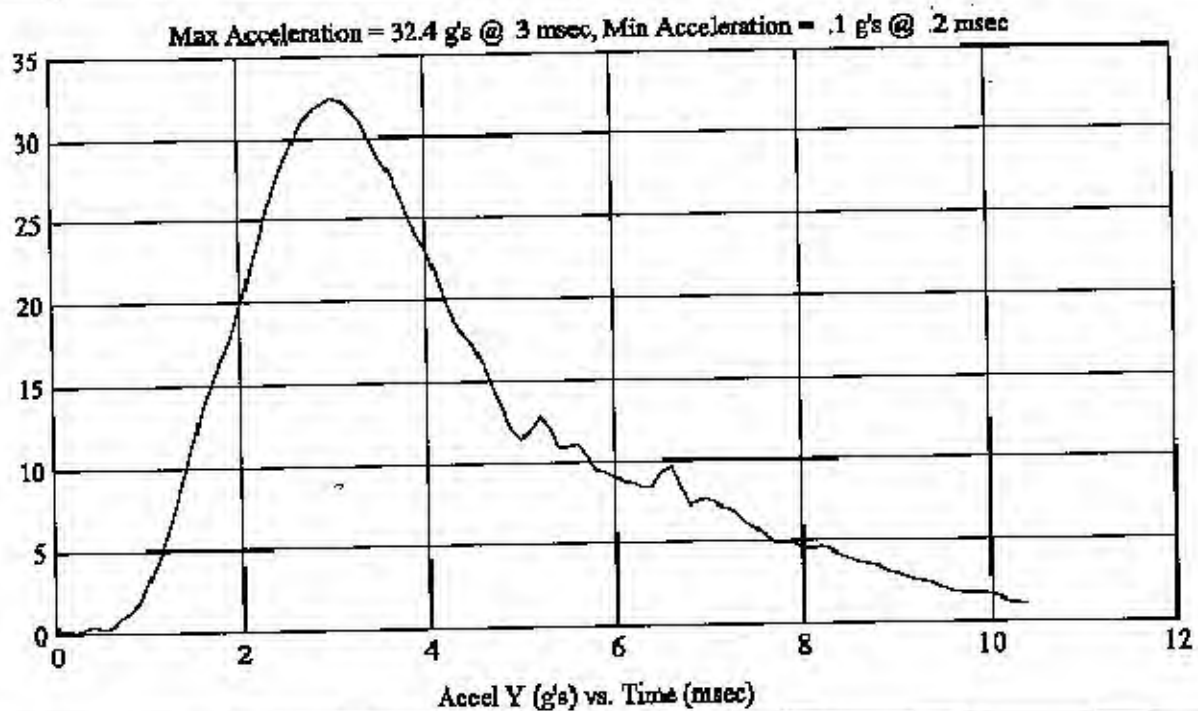
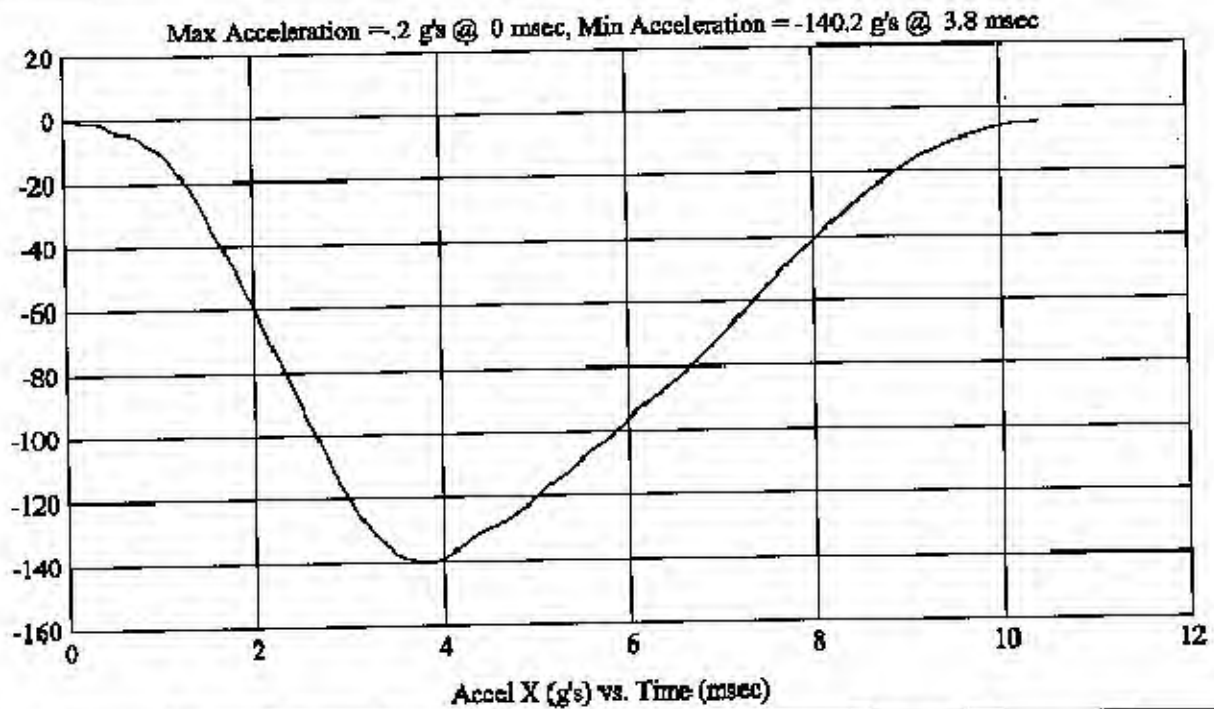


Customer: Subaru  
Test # 6  
FM4715  
Additional Desc: N/A

Vehicle Program : Outback  
Test Date: 11/30/04

Model Year: 2005  
Target: FH1  
Vehicle Side: Right  
Horz/Vert Angle: 180/50

HIC(d) = 770, HIC = 800, Delta T = 5.4 msec



FMH  
G0517-001.2

3-55

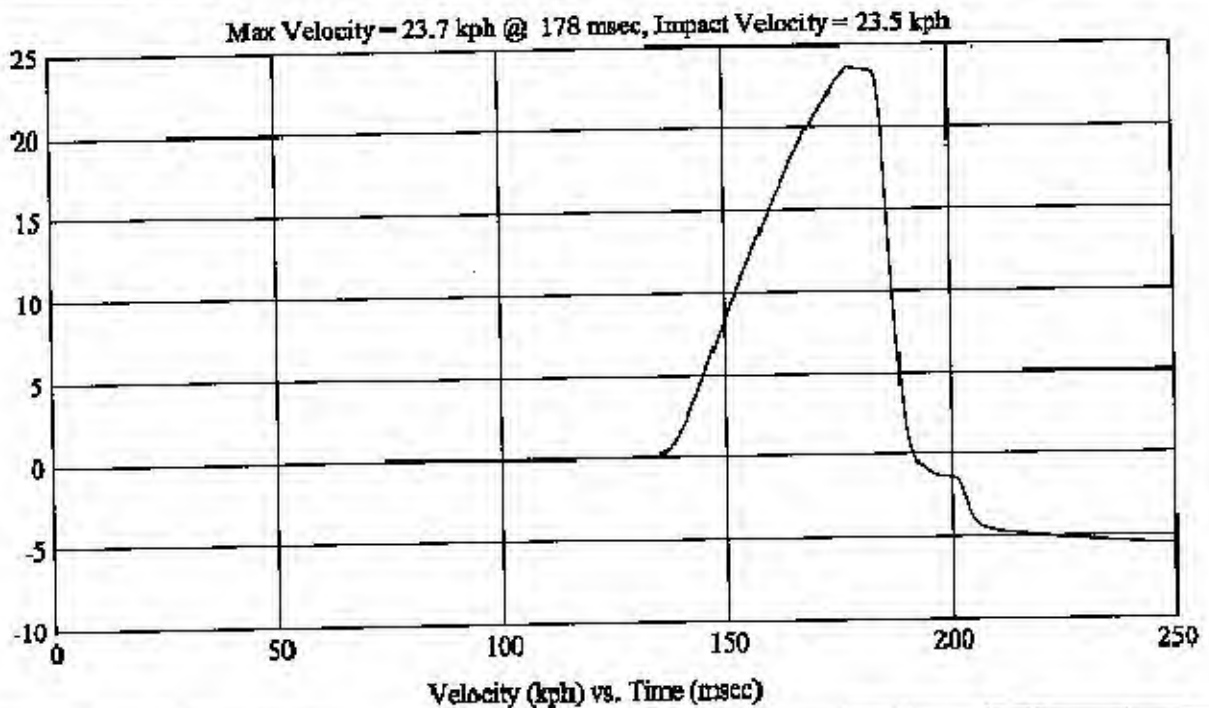
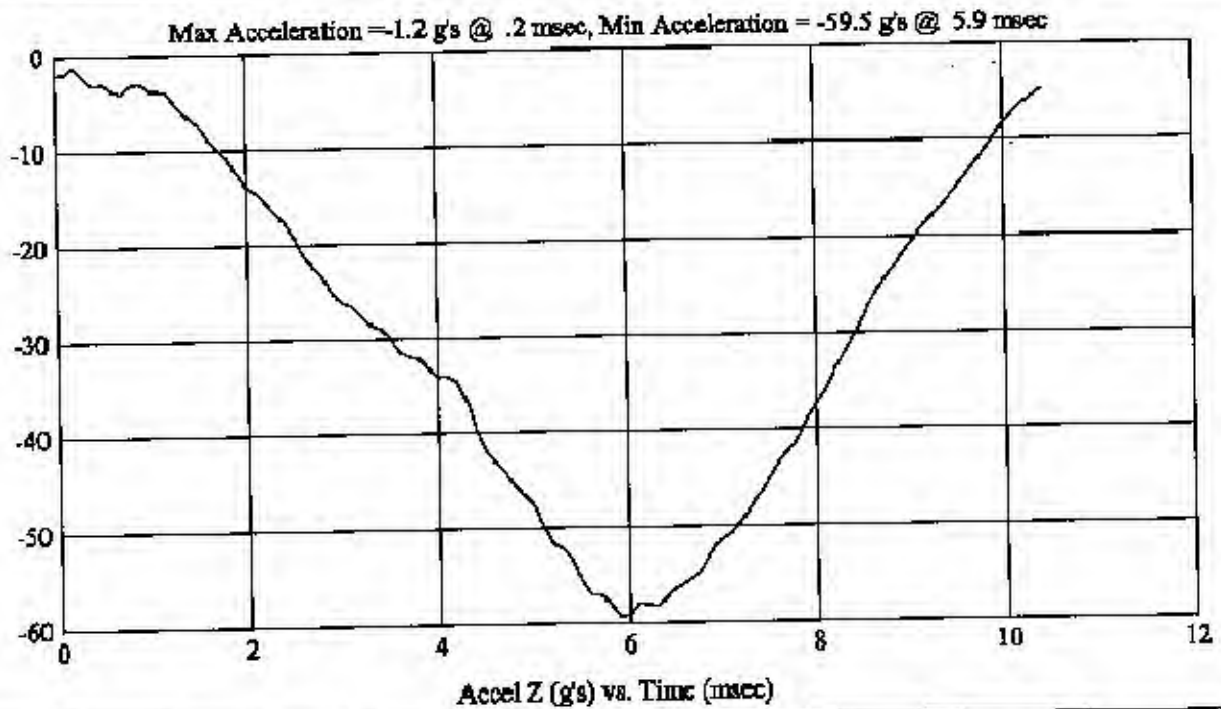
Customer: Subaru  
Test # 6  
FM4715  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: FH1  
Vehicle Side: Right  
Horz/Vert Angle: 180/50

HIC(d) = 770, HIC = 800, Delta T = 5.4 msec





FMH  
G0517-001.2

3-56

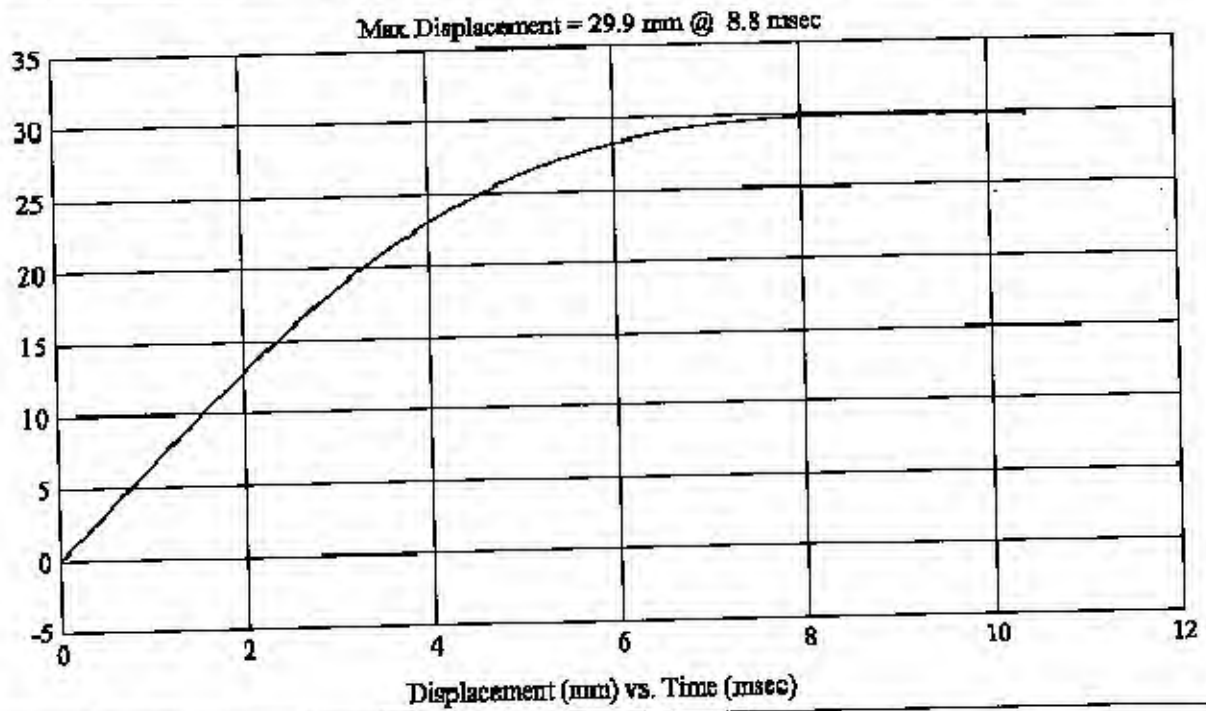
Customer: Subaru  
Test # 6  
FM4715  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: FH1  
Vehicle Side: Right  
Horz/Vert Angle: 180/50

HIC(d) = 770, HIC = 800, Delta T = 5.4 msec



12/5/04 Impact Testing  
2005 SUBARU OUTBACK  
KMYSS 2005 - UPPER INTERIOR  
TEST #10 C85501 LEFT URT  
IMPACT ANGLE = 270 / 32  
PRE TEST



M34

M556 Testing

2-17-14

C057-0012

2005 SUBARU OUTBACK

ENV01-2011 - UPPER INTERIOR

EFFECT #10 C055501 LEFT UR

REVIEW IMPACT ANGLE = 270/32

7-10-13 13-11-13



12/1/04

12/1/04

2005 SUBARU OUTBACK

HAYSS 1010 UPPER INTERIOR

TEST #10 035501

HV IMPACT ANGLE 740

FM4719

1050118

MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR1 Left  
MGA Test Reference No.: FM4719  
Approach Horizontal Angles: 270°  
Approach Vertical Angles: 32°  
Additional Description:

Test Number: #10  
Temperature: 21C  
Humidity: 31%  
Time of Test: 3:36 PM  
FMH Serial No: 038

#### TEST RESULTS:

HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
542	498	8.9	23.9	60	17 R

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

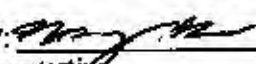
Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J36197	-110	1.44	1.44
Y	6	J36193	101.9	1.54	1.54
Z	7	J36353	96.7	1.17	1.16

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Grab Handle was broken during impact.

Headliner deformation.

Recorded By: 

Approved By: 

Date: 12/1/04

\*Only necessary for NHTSA (Government) Compliance testing.

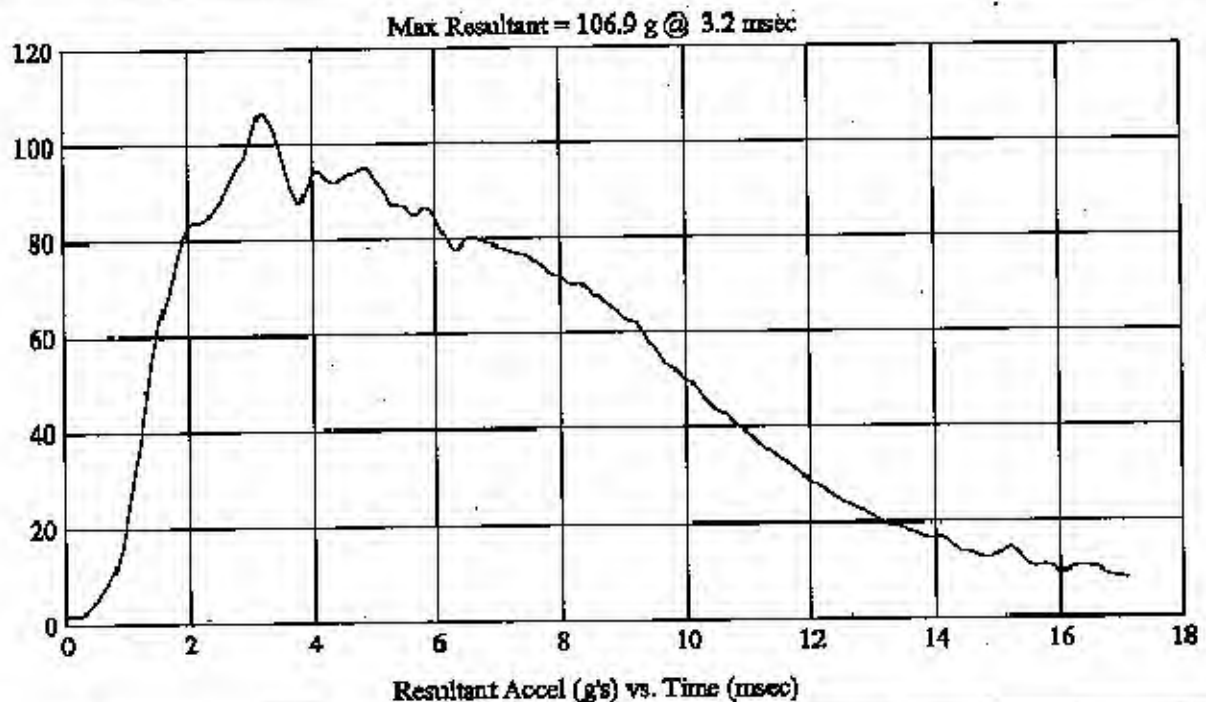
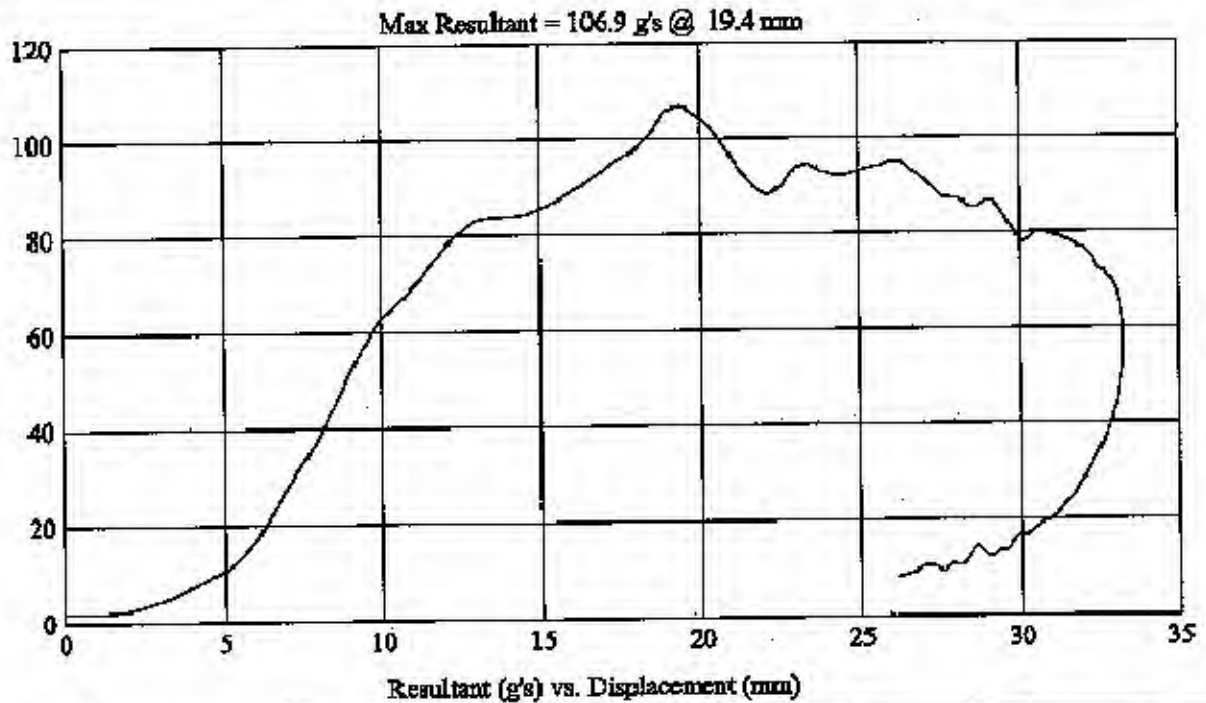
Customer: Subaru  
Test # 10  
FM4719  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: UR1  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 542, HIC = 498, Delta T = 8.9 msec





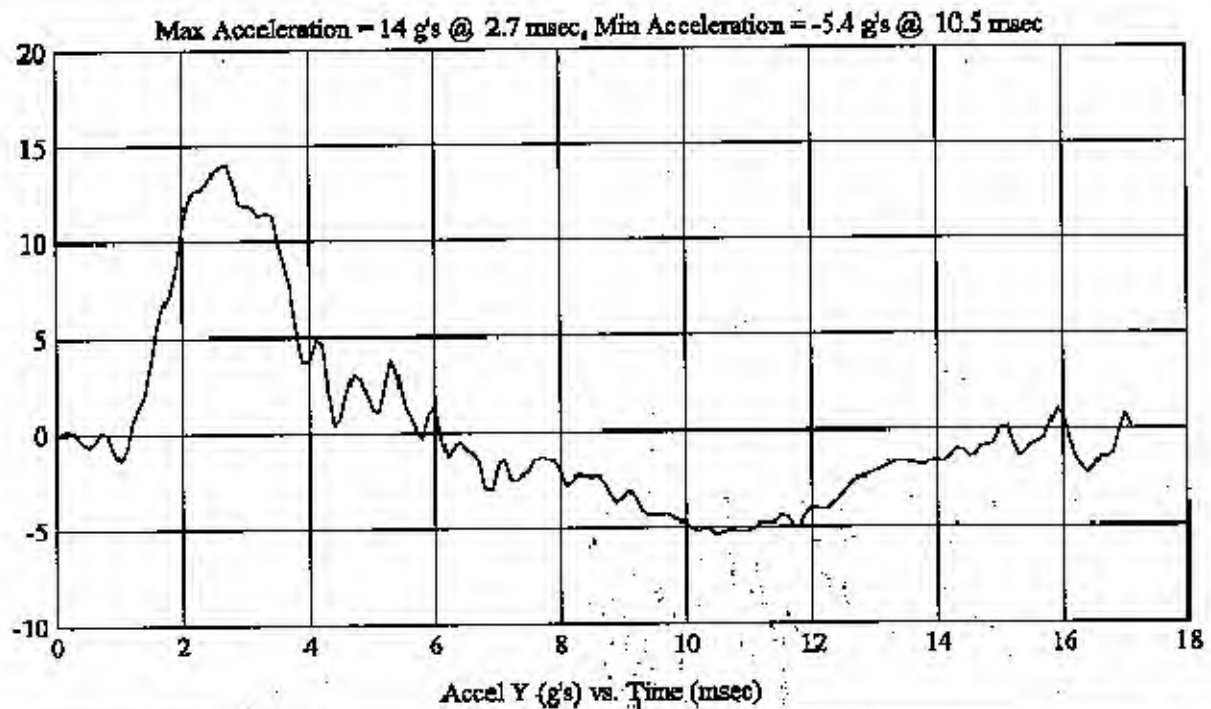
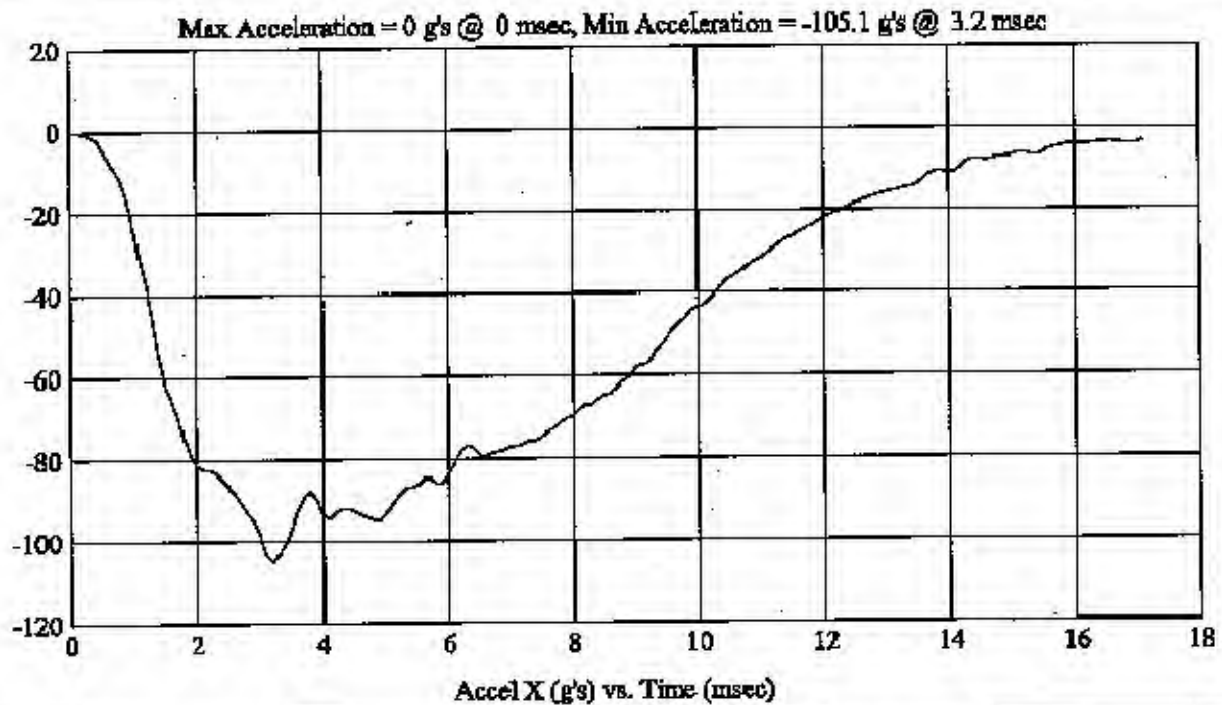
Customer: Subaru  
Test # 10  
FM4719  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: UR1  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 542, HIC = 498, Delta T = 8.9 msec



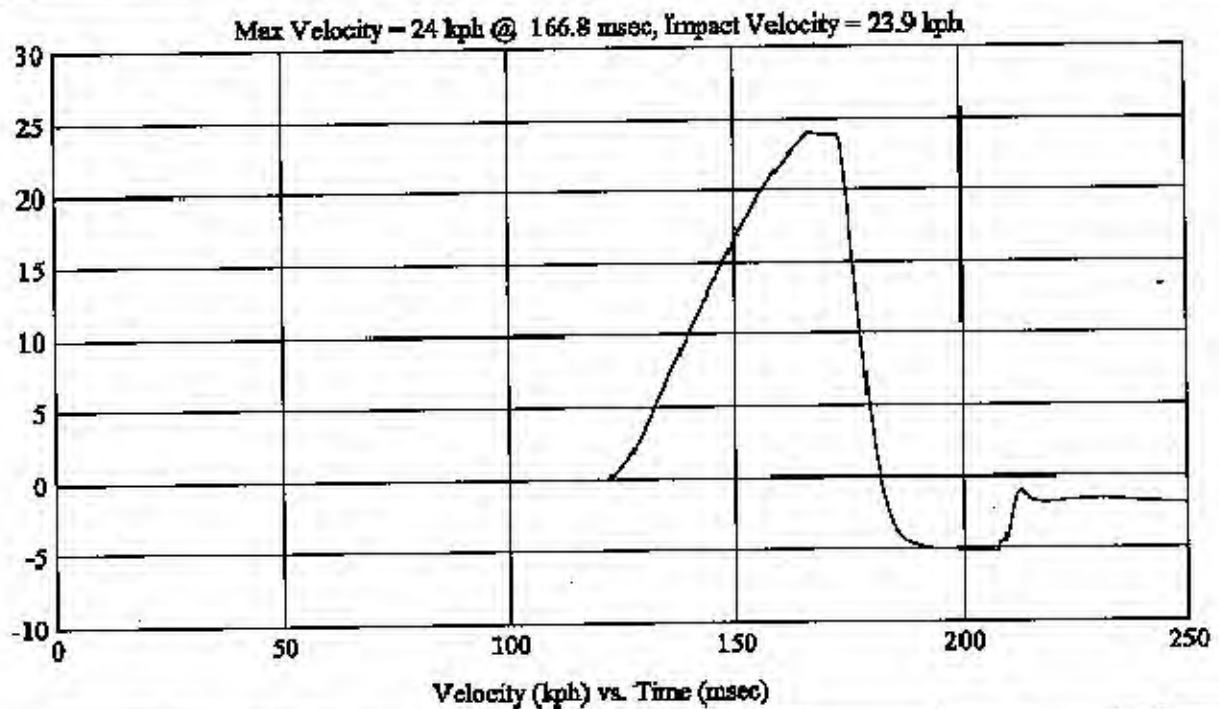
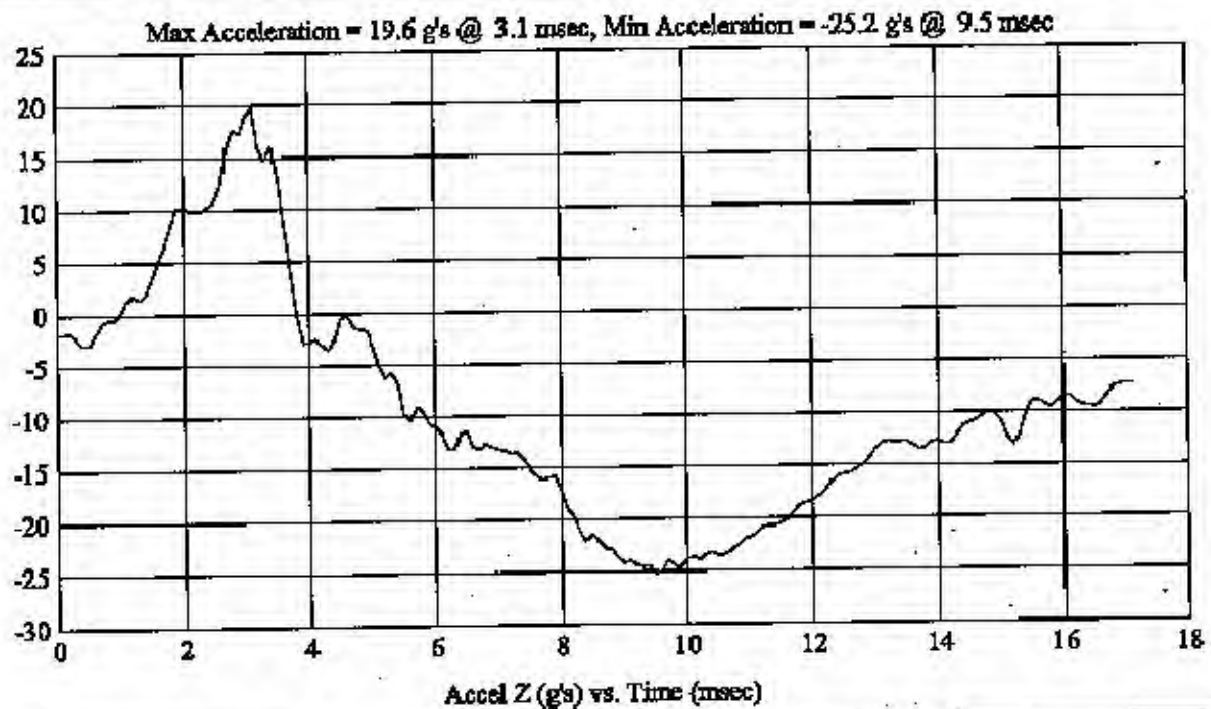
Customer: Subaru  
Test # 10  
FM4719  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: UR1  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 542, HIC = 498, Delta T = 8.9 msec



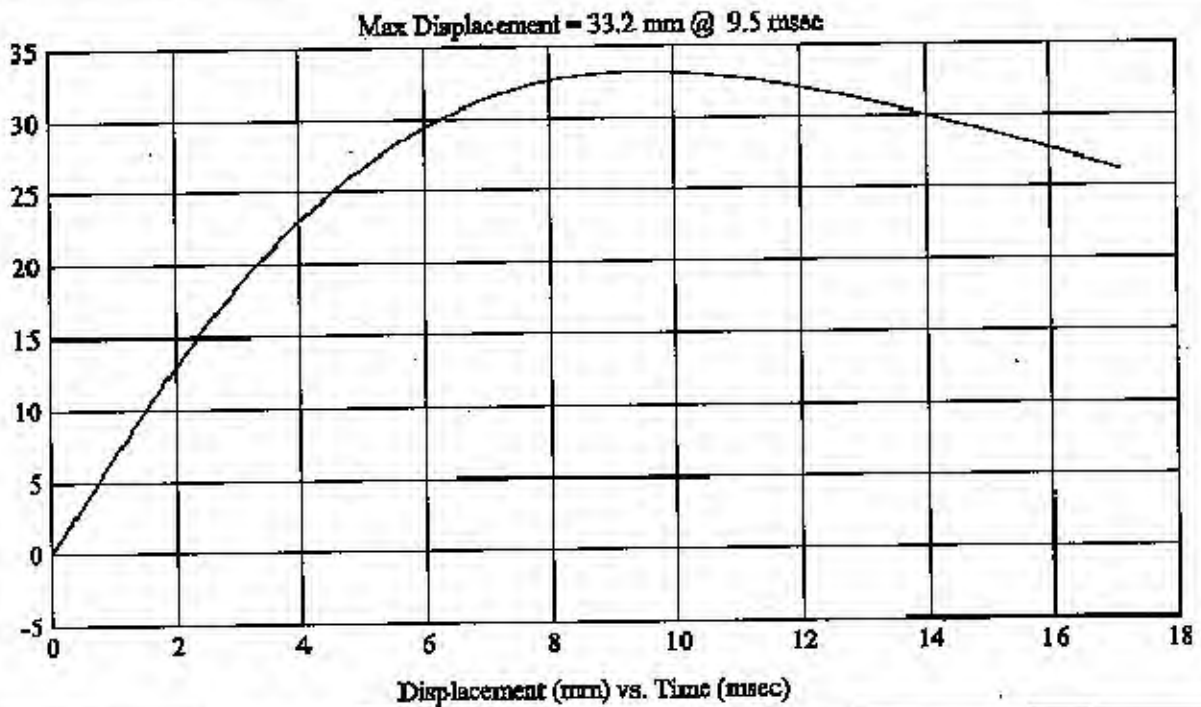
Customer: Subaru  
Test # 10  
FM4719  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: UR1  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 542, HIC = 498, Delta T = 8.9 msec





NHTSA Form 1081

Impact Testing

12/10/04

CRS 7-0113

2005 SUBARU OUTBACK

FMVSS 2010-UPPER INTERIOR

TEST #2 0131M LEFT UPS

HYDRAULIC PISTON 270 #12

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04

11/11/04



MINI-IMP

12-04

2005 SUBARU

IMSS-2011-11-11

ES-112-0111

PA-11-11-11

11-11-11



2144  
2005 SUBARU OUTBACK  
FMVSS 2010 UPPER MURK  
TEST #12 CRASH LEFT SIDE  
HIV IMPACT ANGLE=20.1°  
FM4721



MICHIGAN OPERATIONS  
DATE: 2/3/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
PAGE 1 OF 1

## SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

## GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR3Left  
MGA Test Reference No.: FM4721  
Approach Horizontal Angles: 270°  
Approach Vertical Angles: 32°  
Additional Description:

Test Number: #12

Temperature: 22C

Humidity: 31%

Time of Test: 5:10 PM

FMH Serial No: 037

## TEST RESULTS:

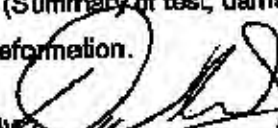
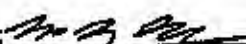
HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
847	902	4.9	23.7	15	5 L

## INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35800	-98.4	1.44	1.43
Y	6	J35841	92.6	1.54	1.54
Z	7	J35791	88.8	1.17	1.14

## REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation.

Recorded By:  Approved By:  Date: 12/1/04

\*Only necessary for NHTSA (Government) Compliance testing.

FMH  
G0517-001.2Customer: Subaru  
Test # 12  
FM4721  
Additional Desc: N/A

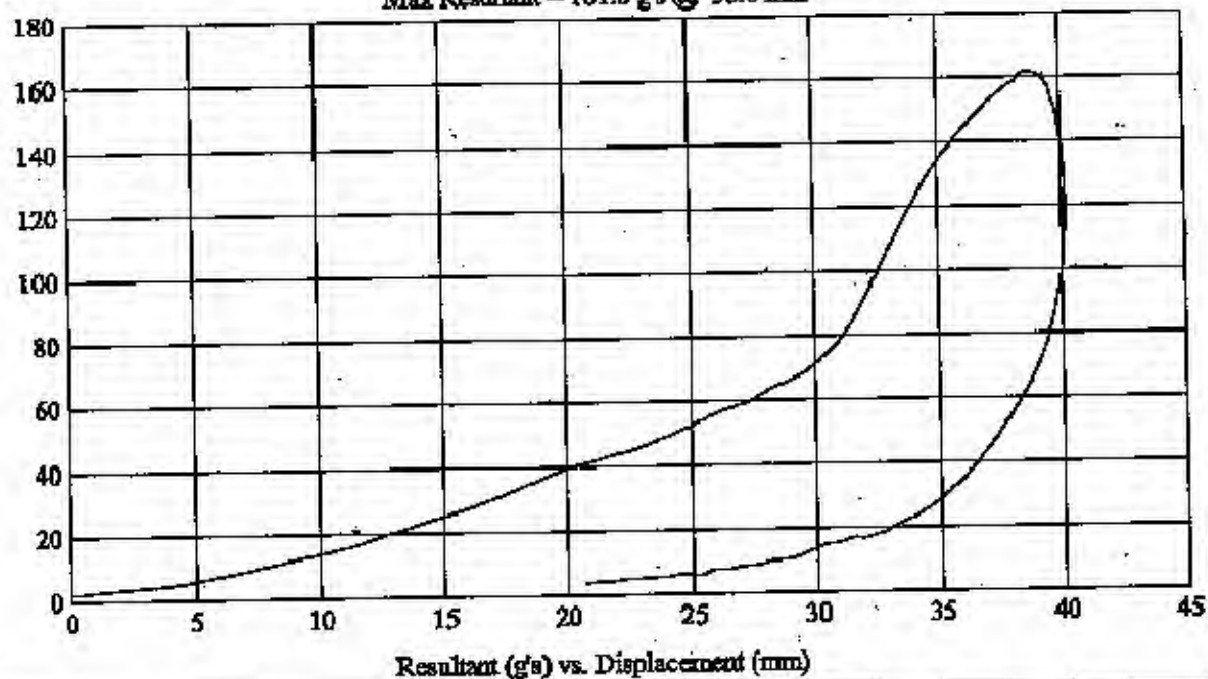
Vehicle Program: Outback

Test Date: 12/1/04

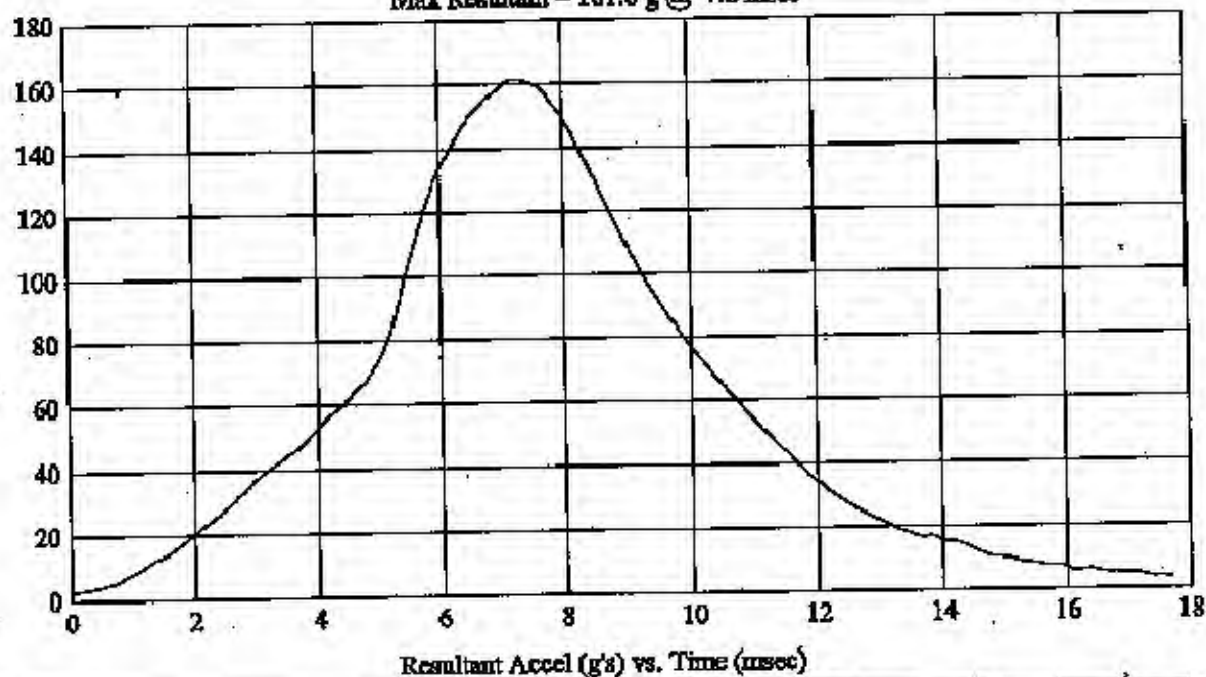
Model Year: 2005  
Target: LR3  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 847, HIC = 902, Delta T = 4.9 msec

Max Resultant = 161.6 g's @ 38.6 mm



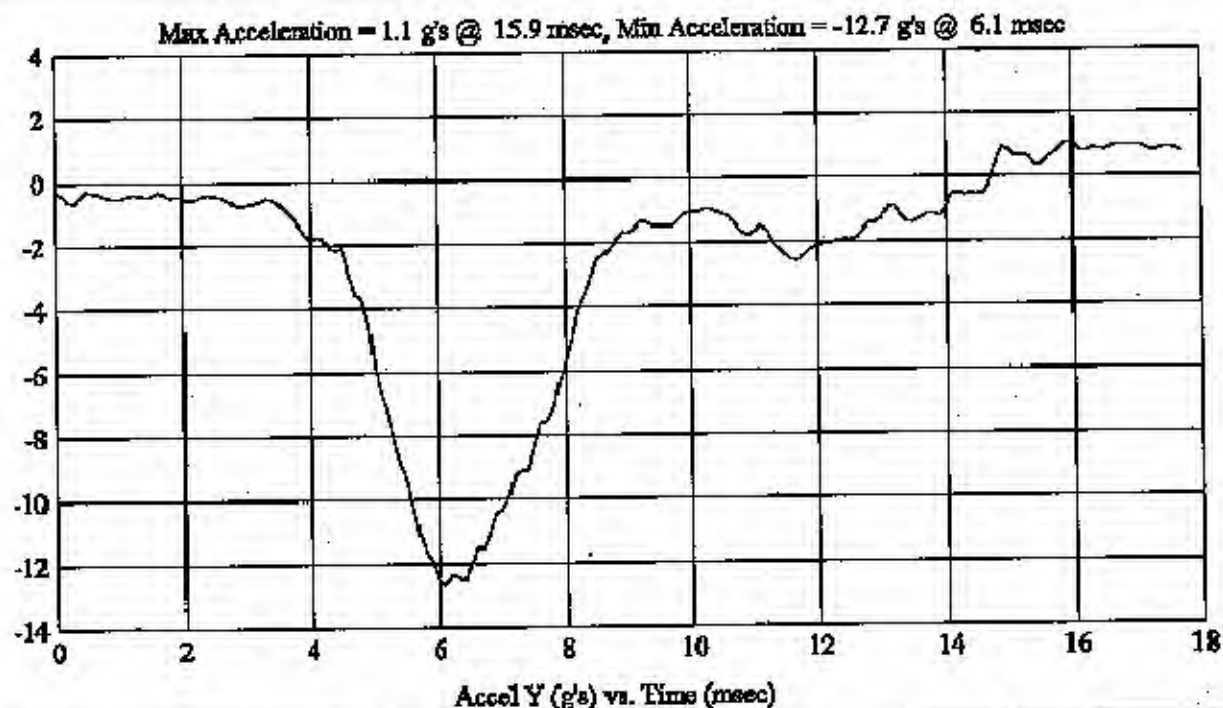
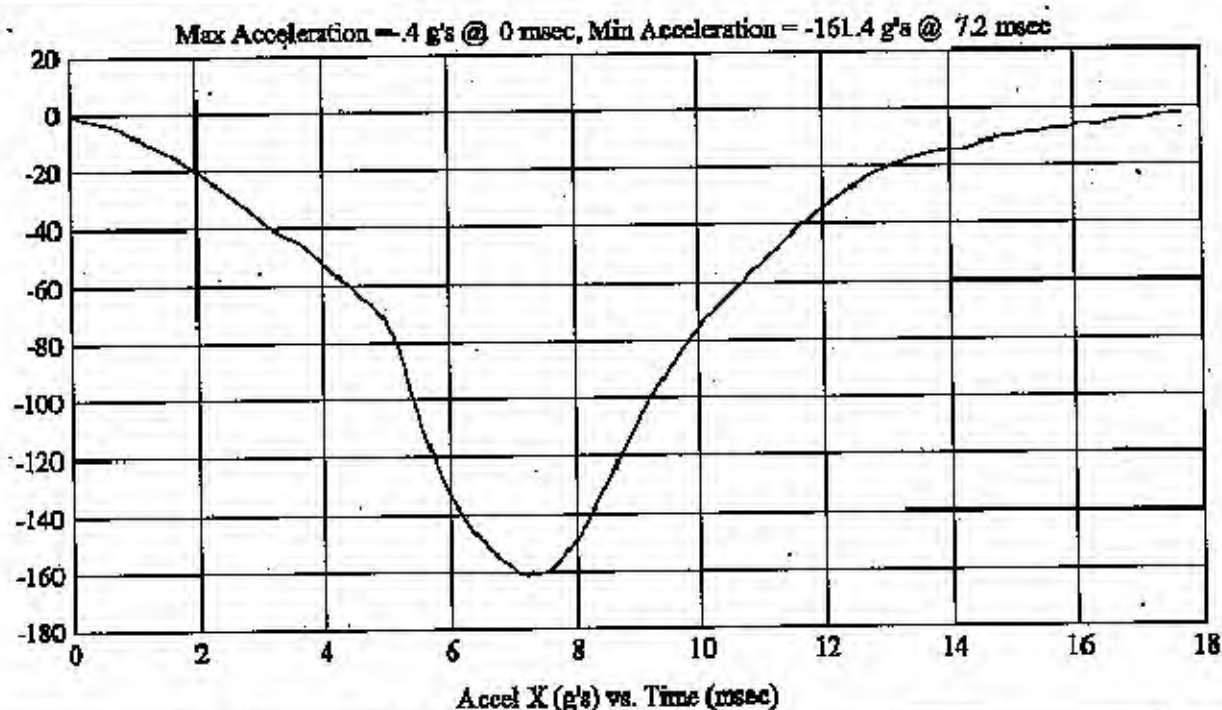
Max Resultant = 161.6 g @ 7.2 msec



FMH  
G05T7-001.2Customer: Subaru  
Test # 12  
FM4721  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: UR3  
Vehicle Side: Left  
Horz/Vert Angle: 270/32 $HIC(d) = 847$ ,  $HIC = 902$ ,  $\Delta T = 4.9 \text{ msec}$ 



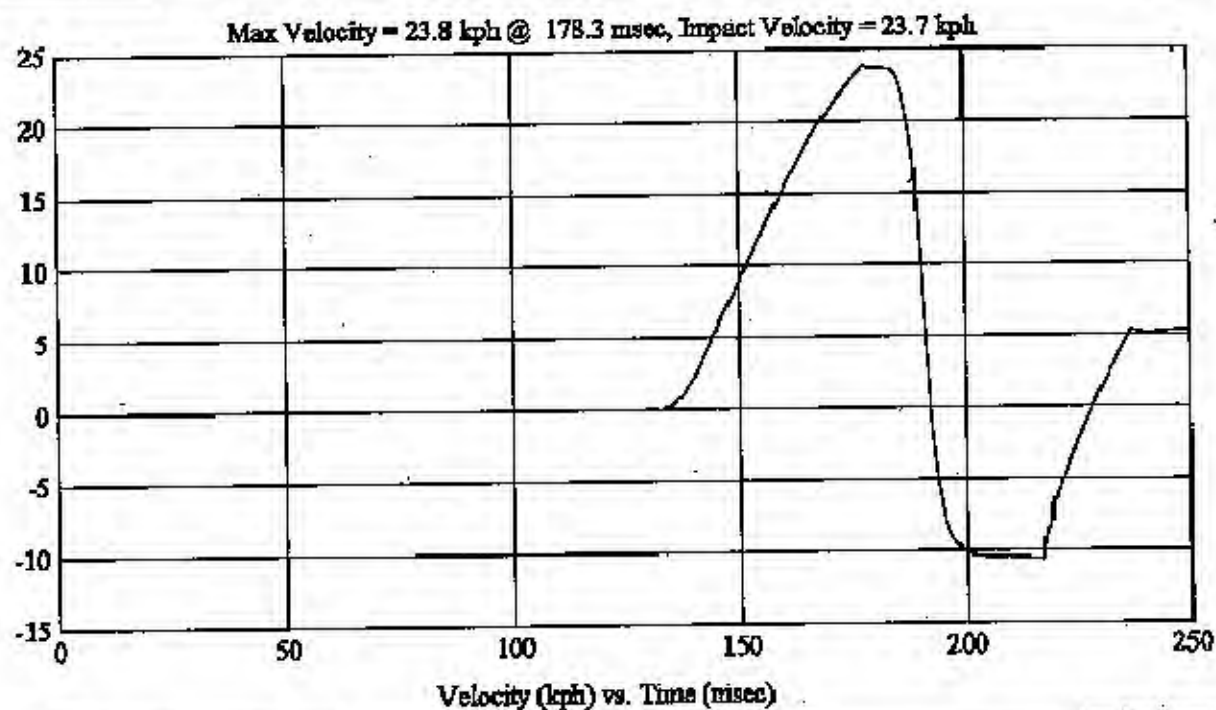
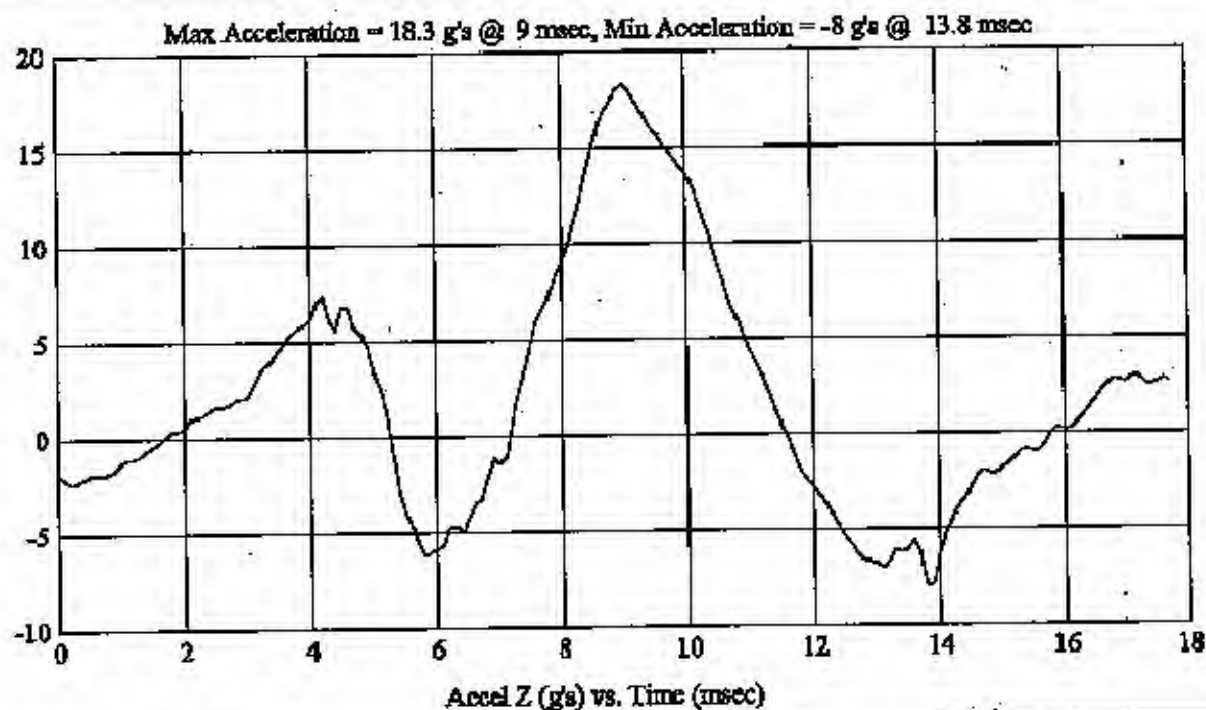
FMH  
G0517-001.2Customer: Subaru  
Test # 12  
FM4721  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005  
Target: UR3  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 847, HIC = 902, Delta T = 49 msec



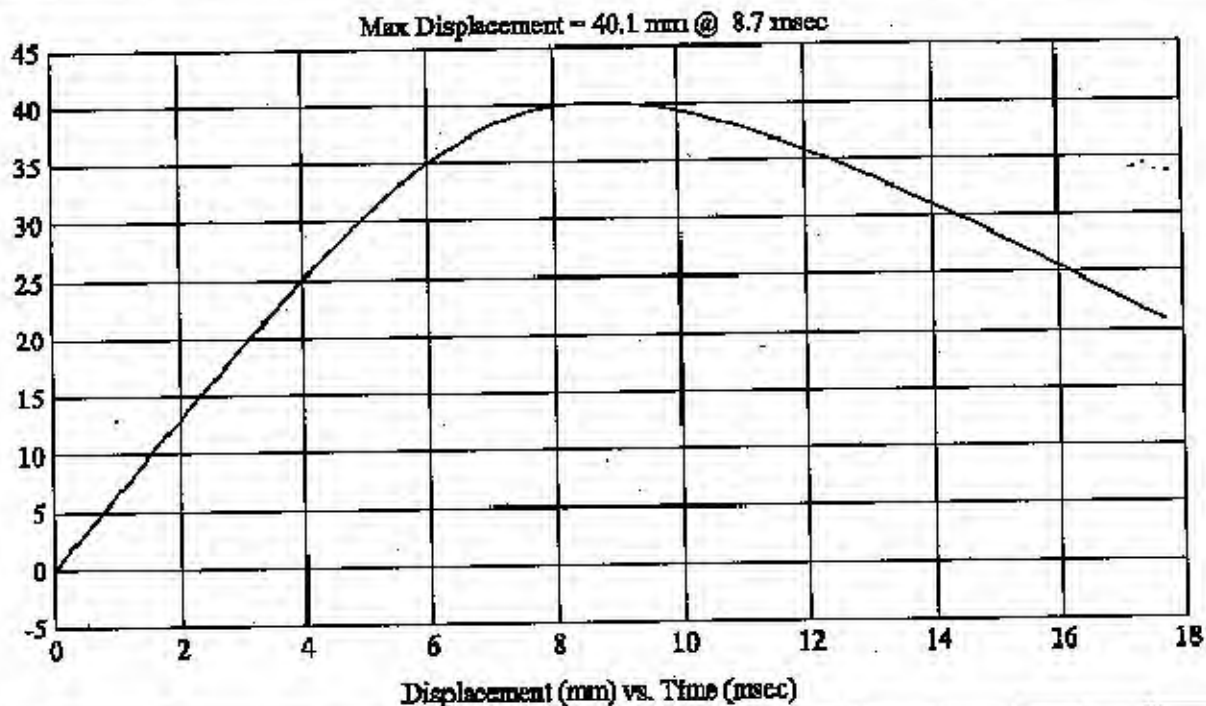
FMH  
G0517-001.2Customer: Subaru  
Test # 12  
FM4721  
Additional Desc: N/A

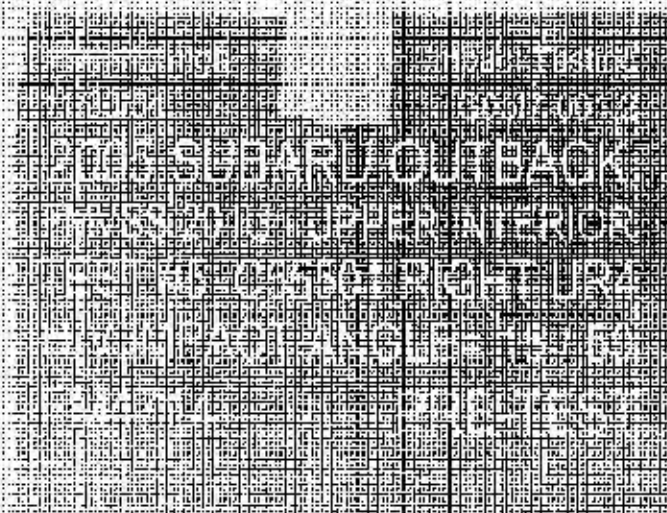
Vehicle Program : Outback

Test Date: 12/1/04

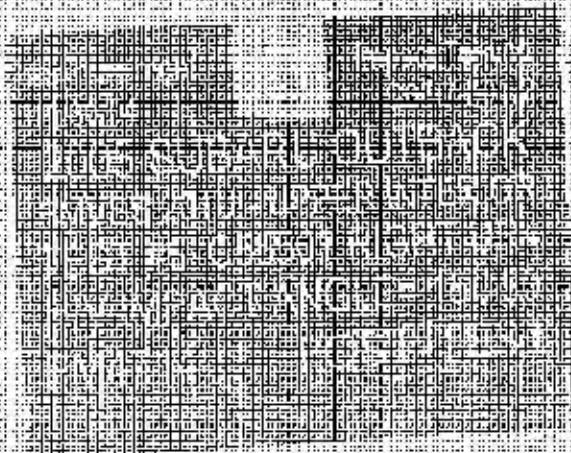
Model Year: 2005  
Target: UR3  
Vehicle Side: Left  
Horz/Vert Angle: 270/32

HIC(d) = 847, HIC = 902, Delta T = 4.9 msec











11/30/04

11/30/04

2005 SUBARU OUTBACK

FMVSS 2010 - UPPER INTERIOR

TEST #5 C55501 RIGHT SIDE

HV IMPACT ANGLE = 15 DEG

FM4714

MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR4 Right

MGA Test Reference No.: FM4714

Approach Horizontal Angles: 15°

Approach Vertical Angles: 50°

Additional Description:

Test Number: #5

Temperature: 22C

Humidity: 31%

Time of Test: 4:38 PM

FMH Serial No: 035

#### TEST RESULTS:

HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
308	188	23.3	24.2	22	7 L

#### INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35924	94.1	1.44	1.44
Y	6	J35919	94.3	1.54	1.54
Z	7	J22654	92.7	1.46	1.17

#### REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: [Signature] Approved By: [Signature] Date: 11/30/04

\*Only necessary for NHTSA (Government) Compliance testing.



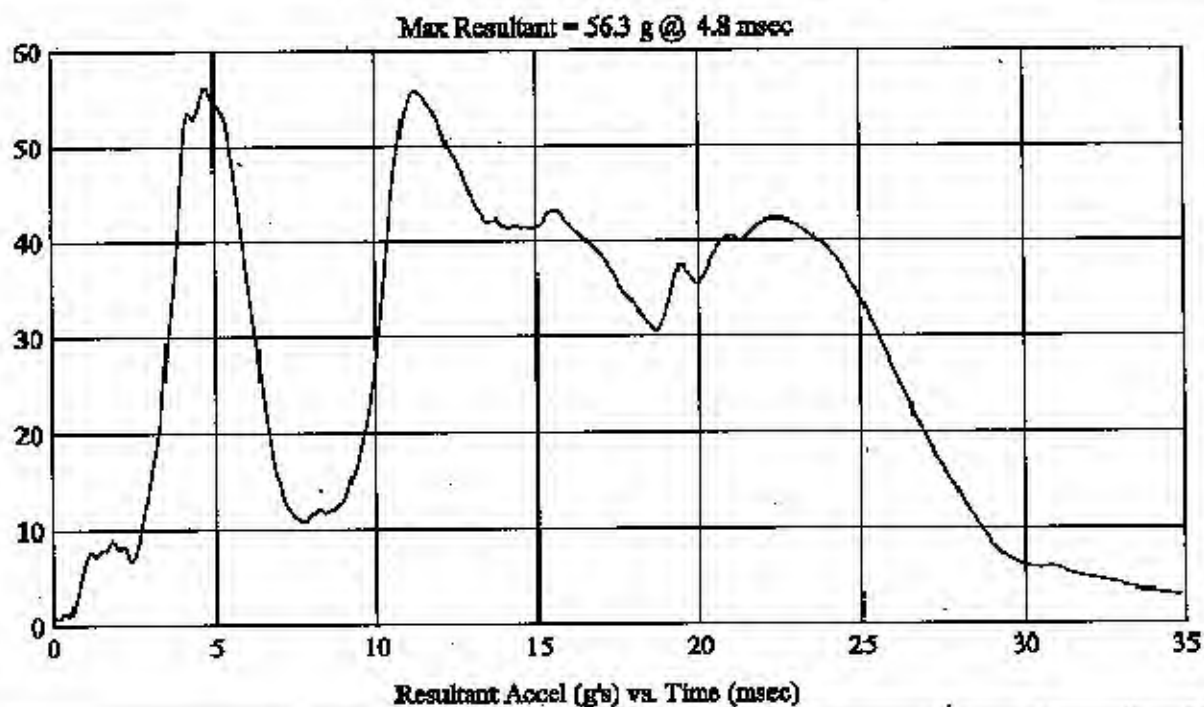
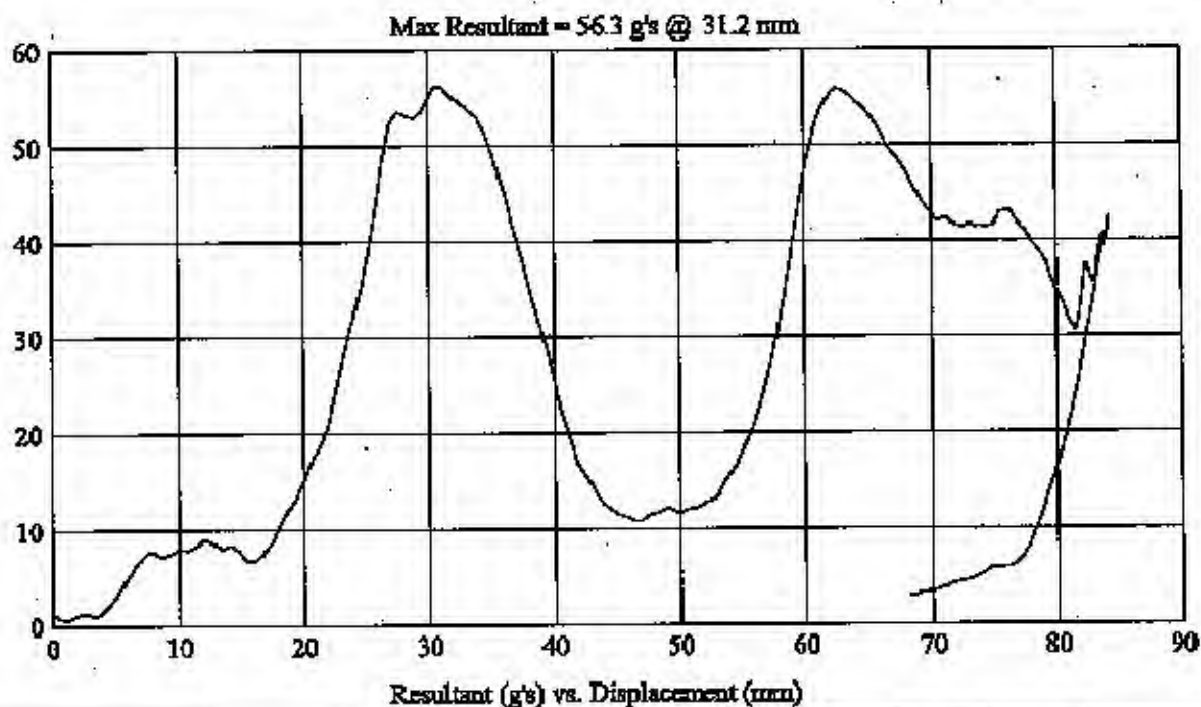
FMH  
G0517-001.2Customer: Subaru  
Test # 5  
FM4714  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR4  
Vehicle Side: Right  
Horz/Vert Angle: 15/50

HIC(d) = 308, HIC = 188, Delta T = 23.3 msec



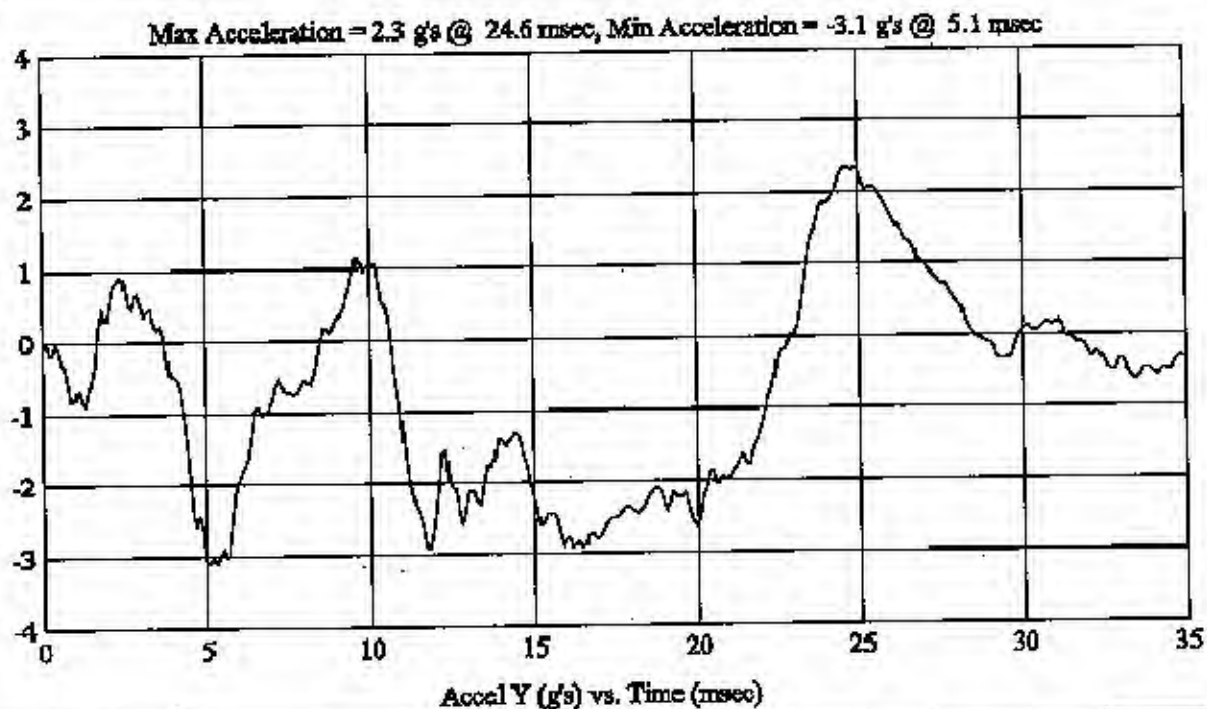
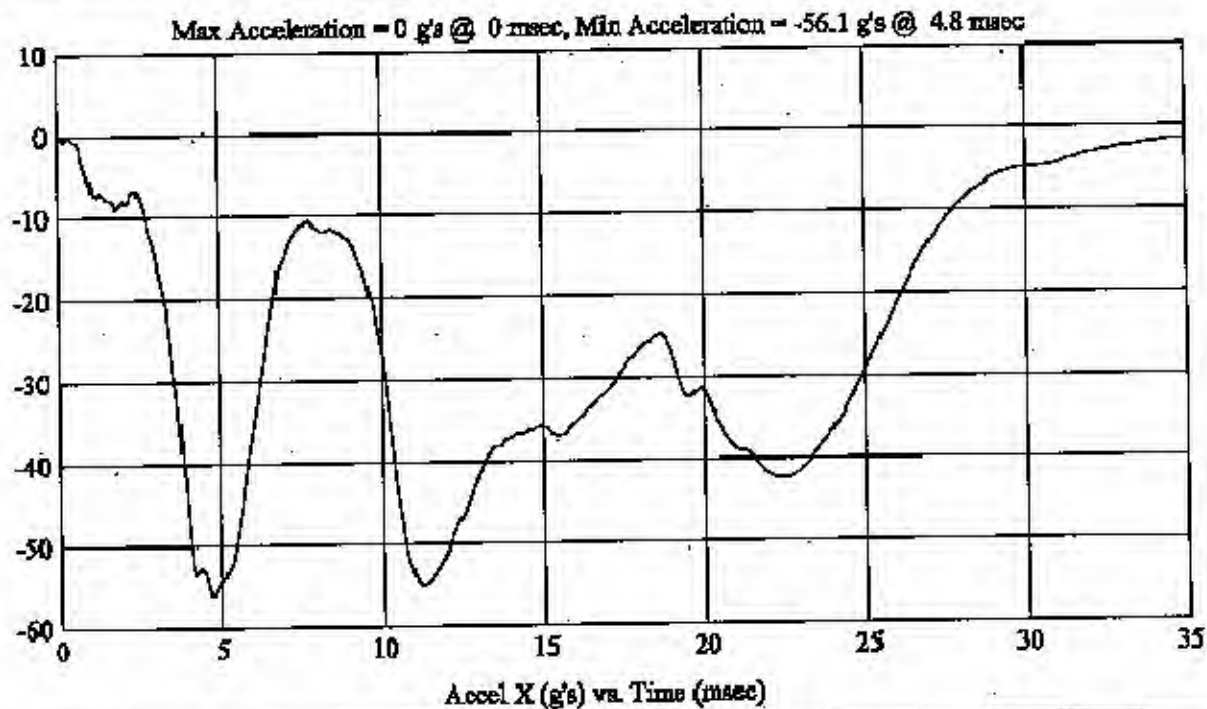
FMH  
G0517-001.2Customer: Subaru  
Test # 5  
FM4714  
Additional Desc: N/A

Vehicle Program: Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR4  
Vehicle Side: Right  
Horz/Vert Angle: 15/50

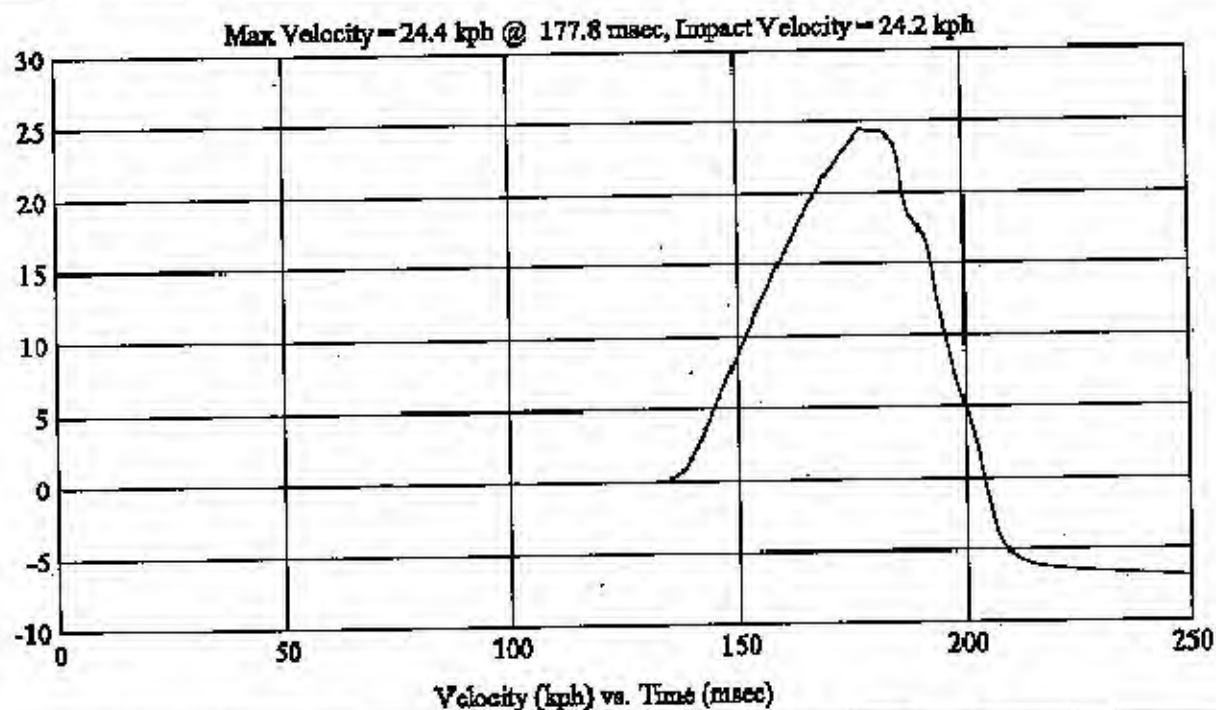
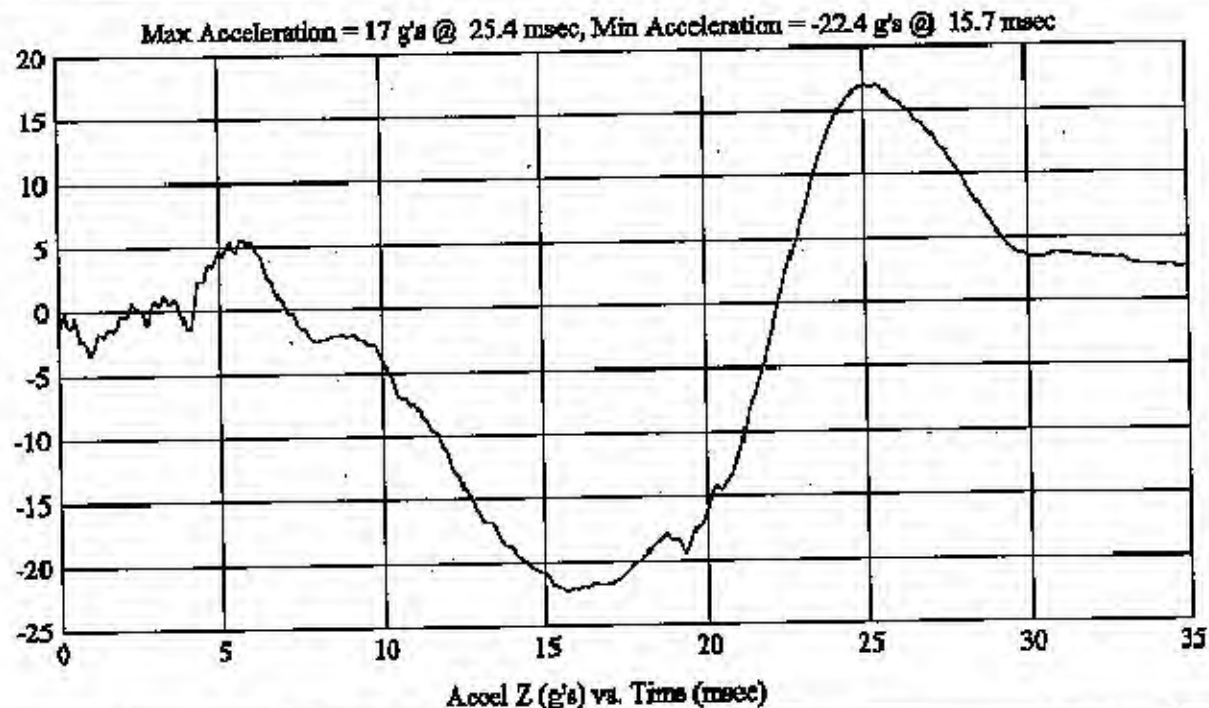
HIC(d) = 308, HIC = 188, Delta T = 23.3 msec



FMH  
G0517-0012Customer: Subaru  
Test # 5  
FM4714  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

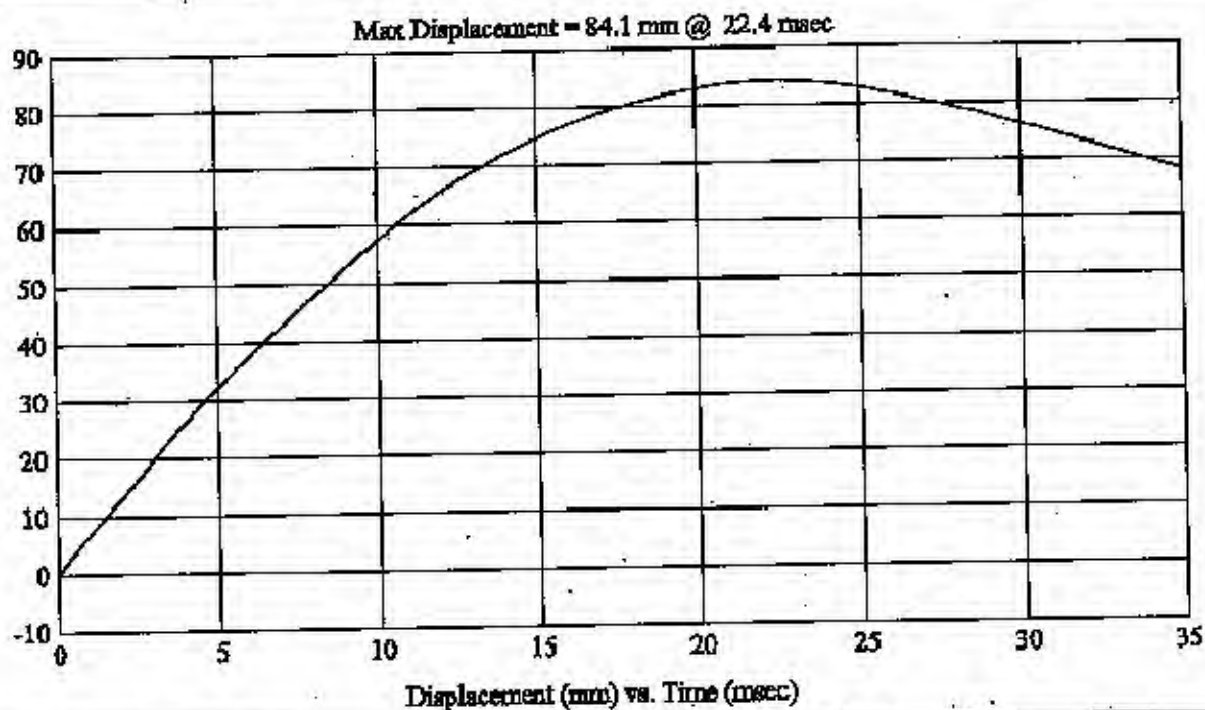
Model Year: 2005  
Target: UR4  
Vehicle Side: Right  
Horz/Vert Angle: 15/50 $HIC(d) = 308$ ,  $HIC = 188$ ,  $\Delta T = 23.3 \text{ msec}$ 

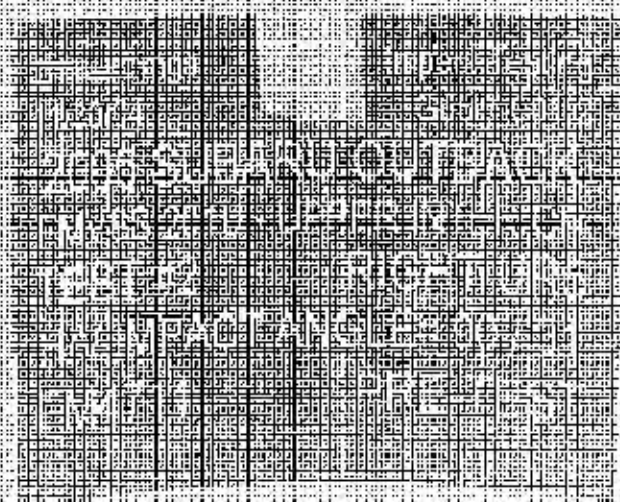


PMH  
G05T7-001.2Customer: Subaru  
Test # 5  
FM4714  
Additional Desc: N/A

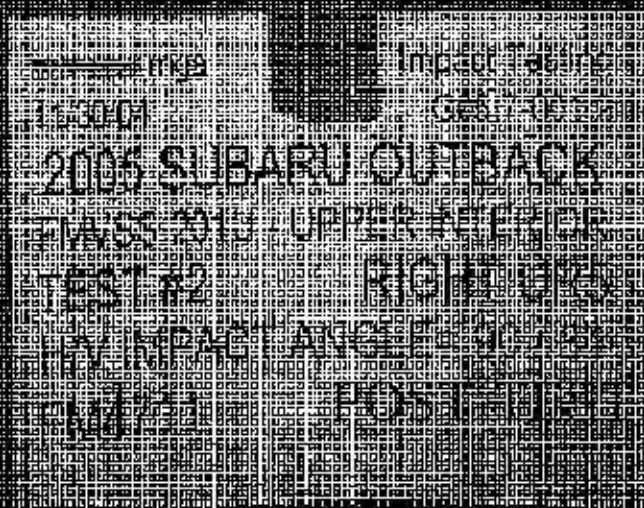
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR4  
Vehicle Side: Right  
Horz/Vert Angle: 15/50 $HIC(d) = 308$ ,  $HIC = 188$ ,  $\Delta T = 23.3 \text{ msec}$ 









UNCLASSIFIED

REF ID: A66666

2005 SUBARU OUTBACK

HMS5200-UP

TEST #2

HAY IMPACT ANGLE

FM4711

MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
PAGE 1 OF 1

### SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

#### GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR5Right

MGA Test Reference No.: FM4711

Approach Horizontal Angles: 90°

Approach Vertical Angles: 31°

Additional Description:

Test Number: #2

Temperature: 22C

Humidity: 31%

Time of Test: 1:50 PM

FMH Serial No: 038

#### TEST RESULTS:

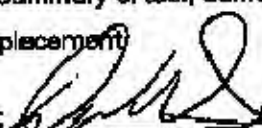

HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
679	679	7.8	23.5	40	0

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35923	-98.8	1.44	1.44
Y	6	J35916	99.7	1.54	1.54
Z	7	J35918	98.1	1.18	1.18

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner displacement

Recorded By:  Approved By:  Date: 11/30/04

\*Only necessary for NHTSA (Government) Compliance testing.

FMH  
G0517-001.2Customer: Subaru  
Test # 2  
FM4711  
Additional Desc: N/A

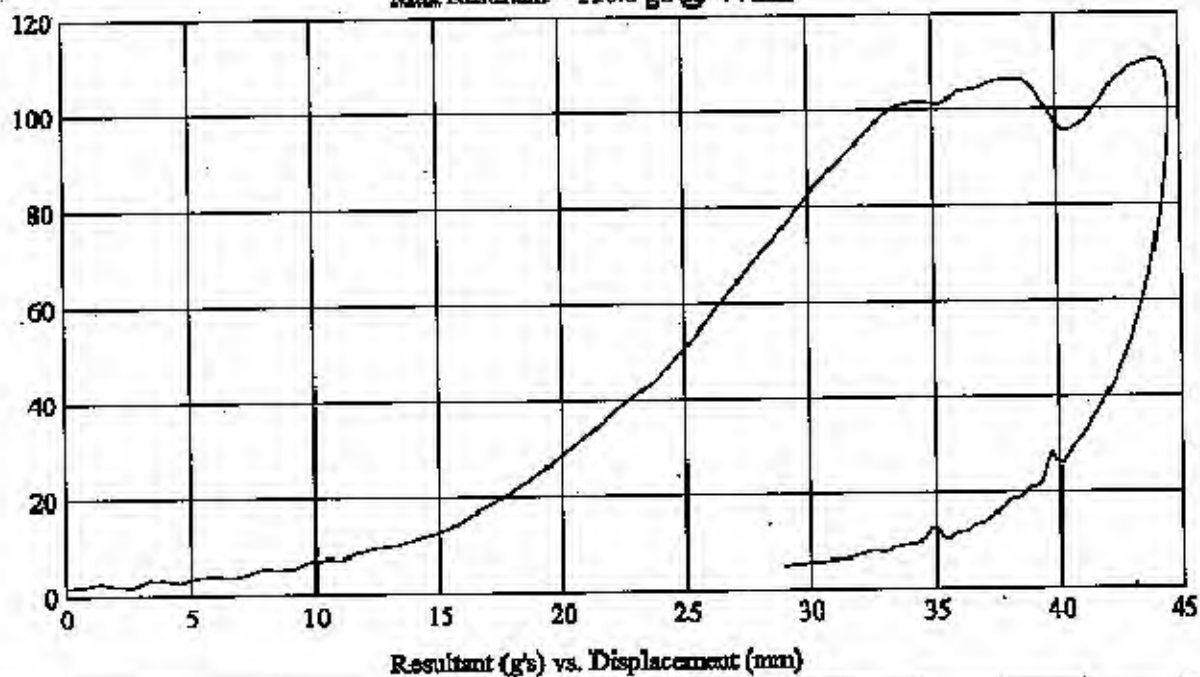
Vehicle Program : Outback

Test Date: 11/30/04

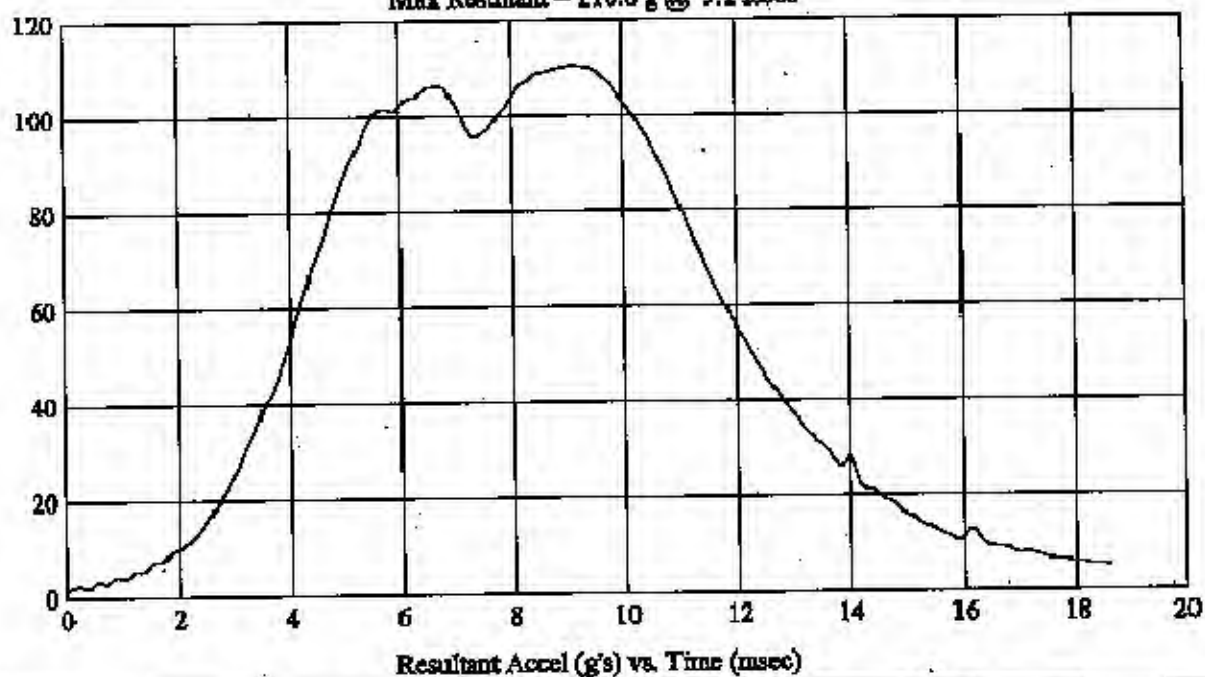
Model Year: 2005  
Target: UR5  
Vehicle Side: Right  
Horz/Vert Angle: 90/31

HIC(d) = 679, HIC = 679, Delta T = 7.8 msec

Max Resultant = 110.6 g's @ 44 mm



Max Resultant = 110.6 g @ 9.1 msec





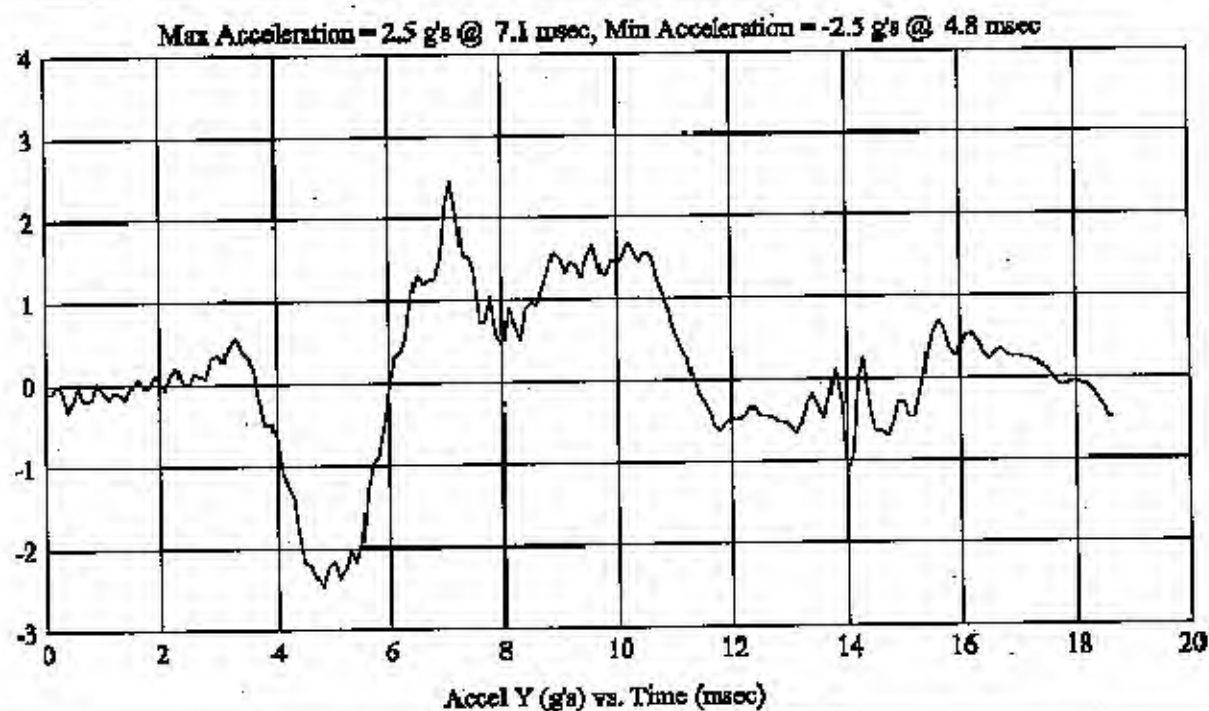
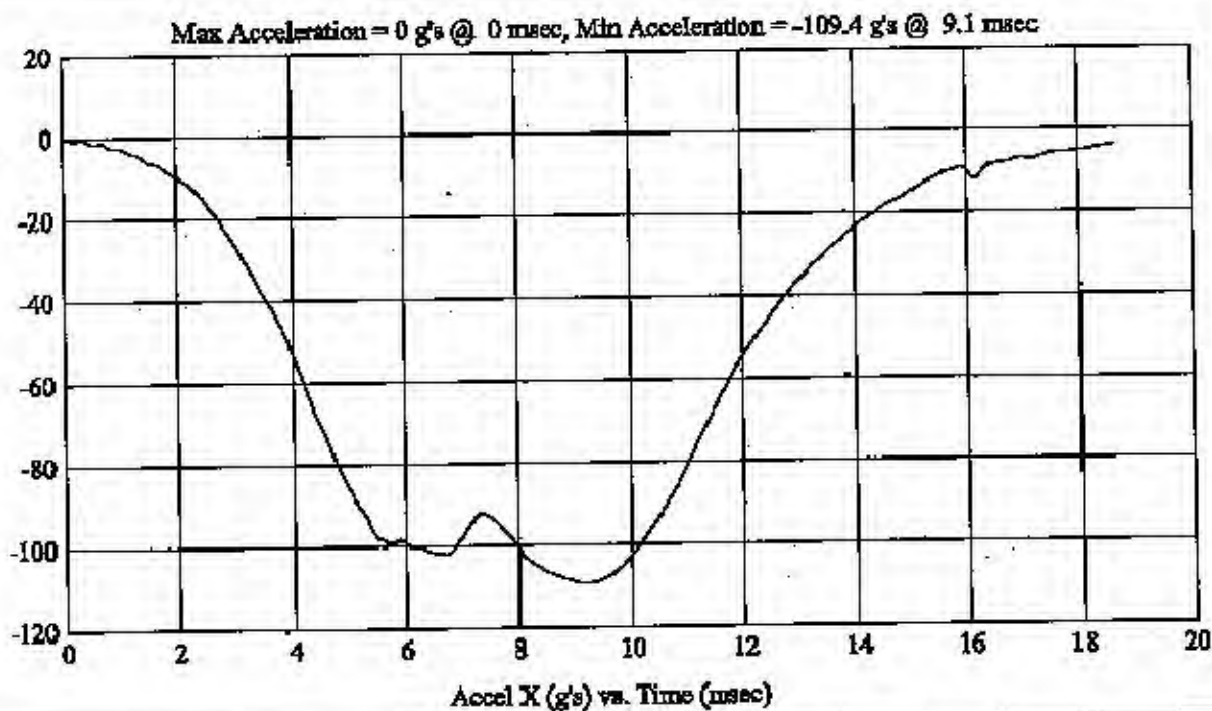
FMH  
G0517-001.2Customer: Subaru  
Test # 2  
FM4711  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR5  
Vehicle Side: Right  
Horz/Vert Angle: 90/31

HIC(3) = 679, HIC = 679, Delta T = 7.8 msec



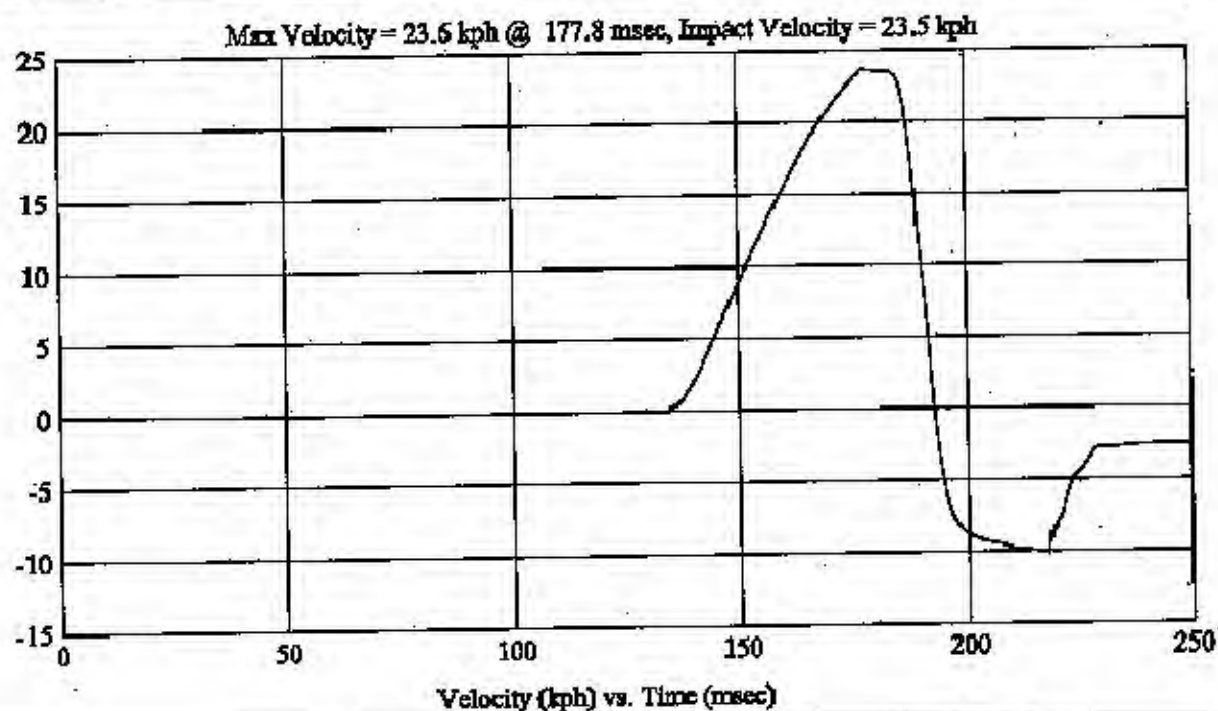
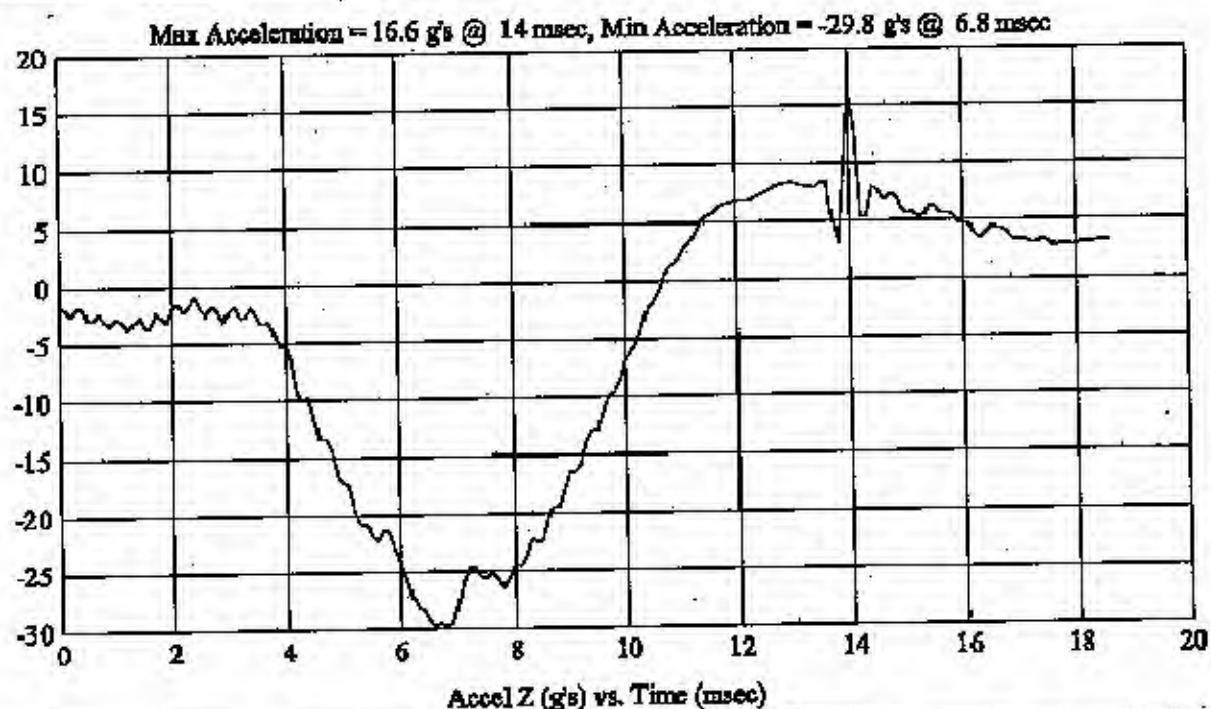
FMH  
G0517-001.2Customer: Subaru  
Test # 2  
FM4711  
Additional Desc: N/A

Vehicle Program: Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR5  
Vehicle Side: Right  
Horz/Vert Angle: 90/31

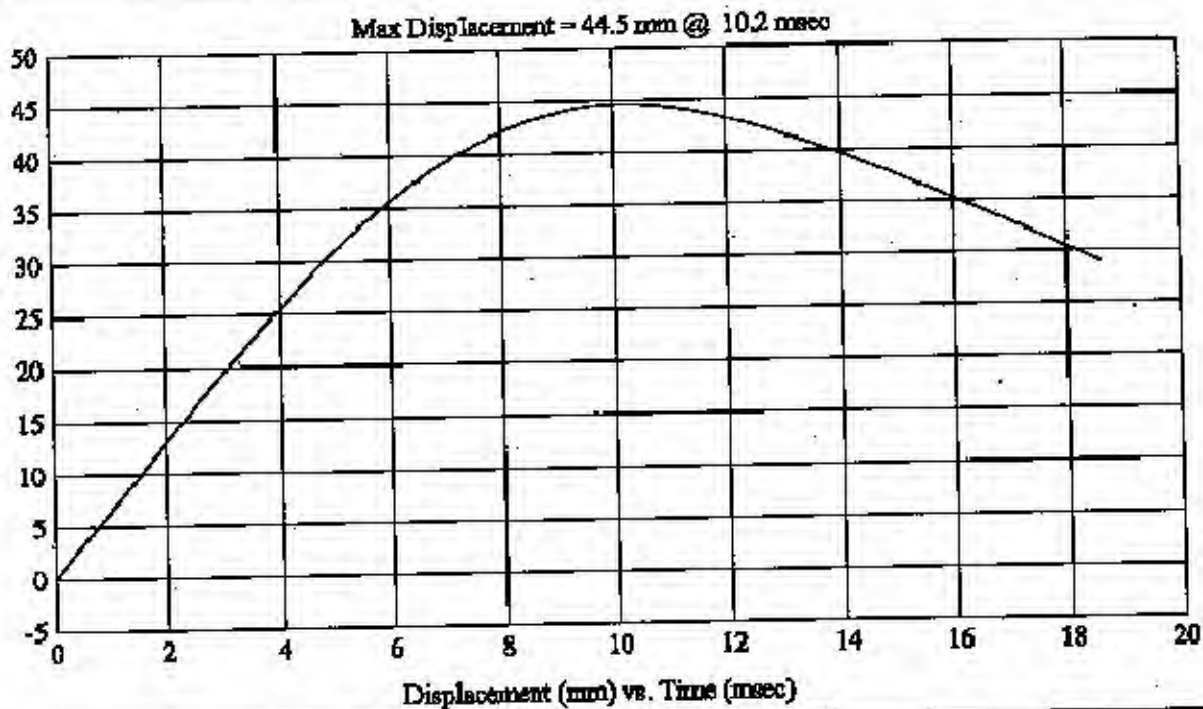
HIC(d) = 679, HIC = 679, Delta T = 7.8 msec



FMH  
G0517-001.2Customer: Subaru  
Test # 2  
FM4711  
Additional Desc: N/A

Vehicle Program : Onback

Test Date: 11/30/04

Model Year: 2005  
Target: UR5  
Vehicle Side: Right  
Horz/Vert Angle: 90/31 $HIC(d) = 679, HIC = 679, \Delta T = 7.8 \text{ msec}$ 



11/30/04

11/30/04

2005 SUBARU OUTBACK

FMVSS 2010-UPPER BODY

TEST #3 RIGHT SIDE

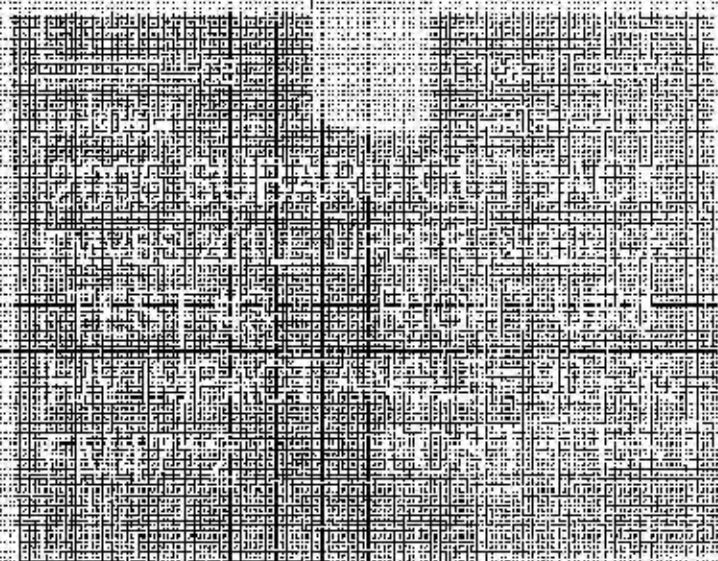
IMPACT ANGLE 5 DEGREES

FMVSS 2010-UPPER BODY



2005 SUBARU OUTBACK  
MAY 2010 - UPPER INTERIOR  
TEST #3 - FRONT  
IMPACT ANGLE 30°  
MAY 2010 - FRONT







MICHIGAN OPERATIONS  
DATE: 2/8/01  
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3  
REVISION NO.: 2  
PAGE 1 OF 1

## SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.2 VEHICLE YR/MAKE/MODEL: 2005/Subaru/Outback

## GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR6 Right

MGA Test Reference No.: FM4712

Approach Horizontal Angles: 90°

Approach Vertical Angles: 33°

Additional Description:

Test Number: #3

Temperature: 22C

Humidity: 31%

Time of Test: 2:40 PM

FMH Serial No: 037

## TEST RESULTS:

HIC(d)	HIC	$\Delta t$ (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt O	Left/Right Pt O
681	683	8.3	23.9	52	13

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7284-2000)

AxIs	Channel	Serial No.	DLR Value	$\Delta V$ Pre-Test	$\Delta V$ Post-Test
X	5	J35800	-98.4	1.44	1.44
Y	6	J35841	92.6	1.54	1.54
Z	7	J35791	88.8	1.18	1.18

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Grab Handle was broken off mount.

Recorded By: [Signature] Approved By: [Signature] Date: 11/30/04

\*Only necessary for NHTSA (Government) Compliance testing.

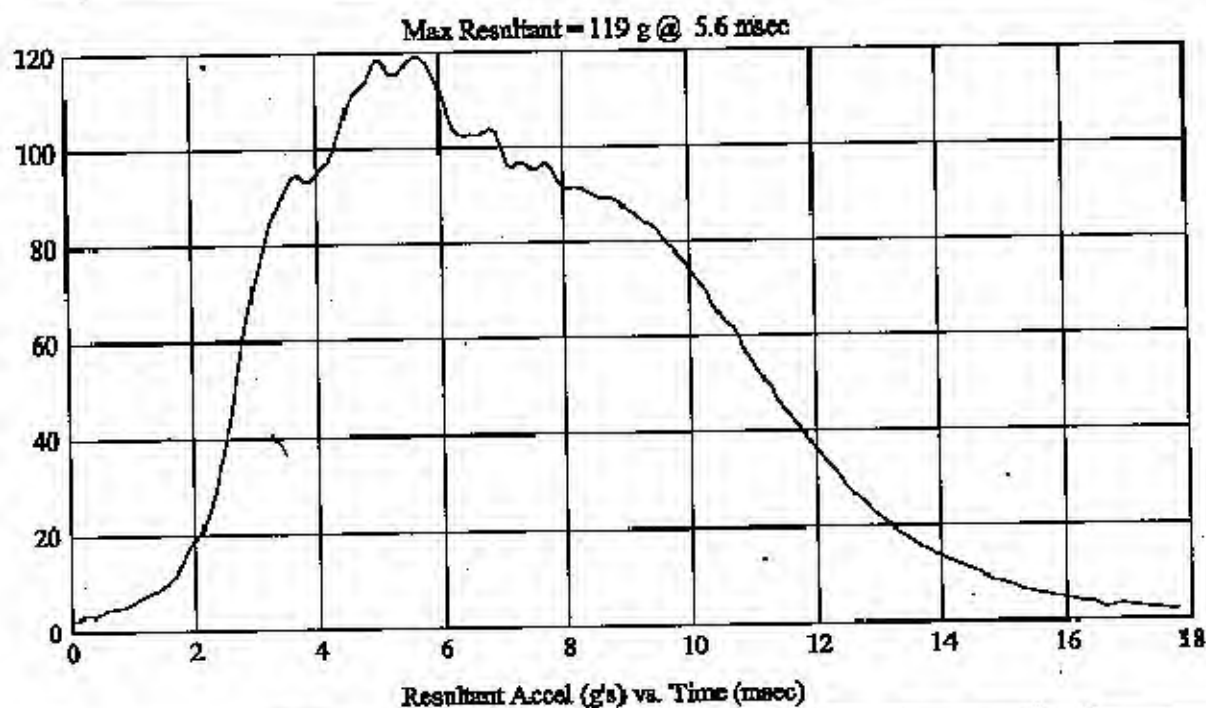
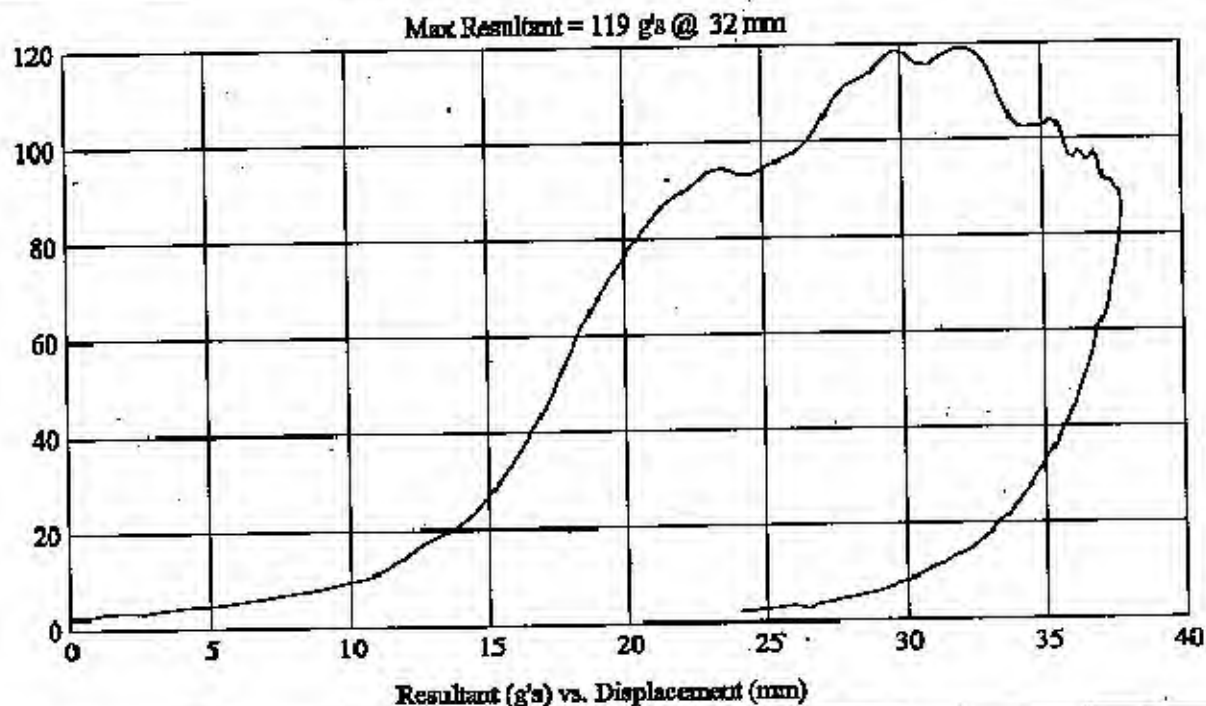
FMH  
G05T7-001.2Customer: Subaru  
Test # 3  
FM4712  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR6  
Vehicle Side: Right  
Horz/Vert Angle: 90/33

HIC(15) = 681, HIC = 683, Delta T = 8.3 msec



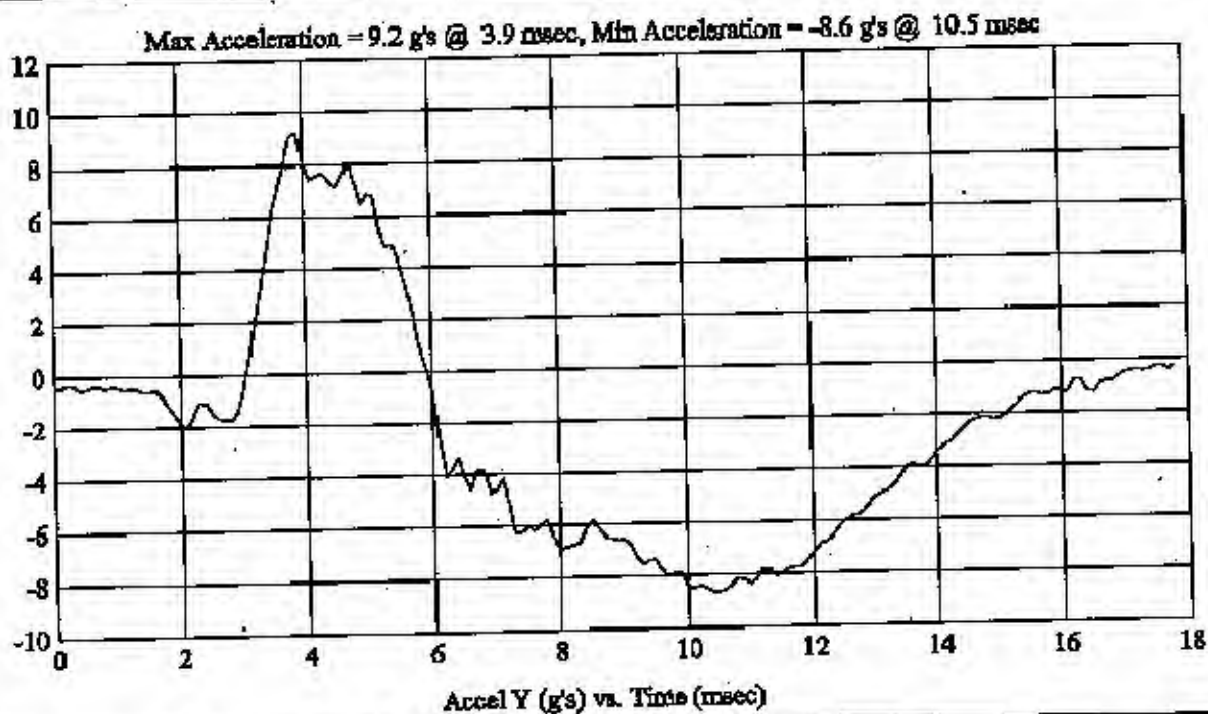
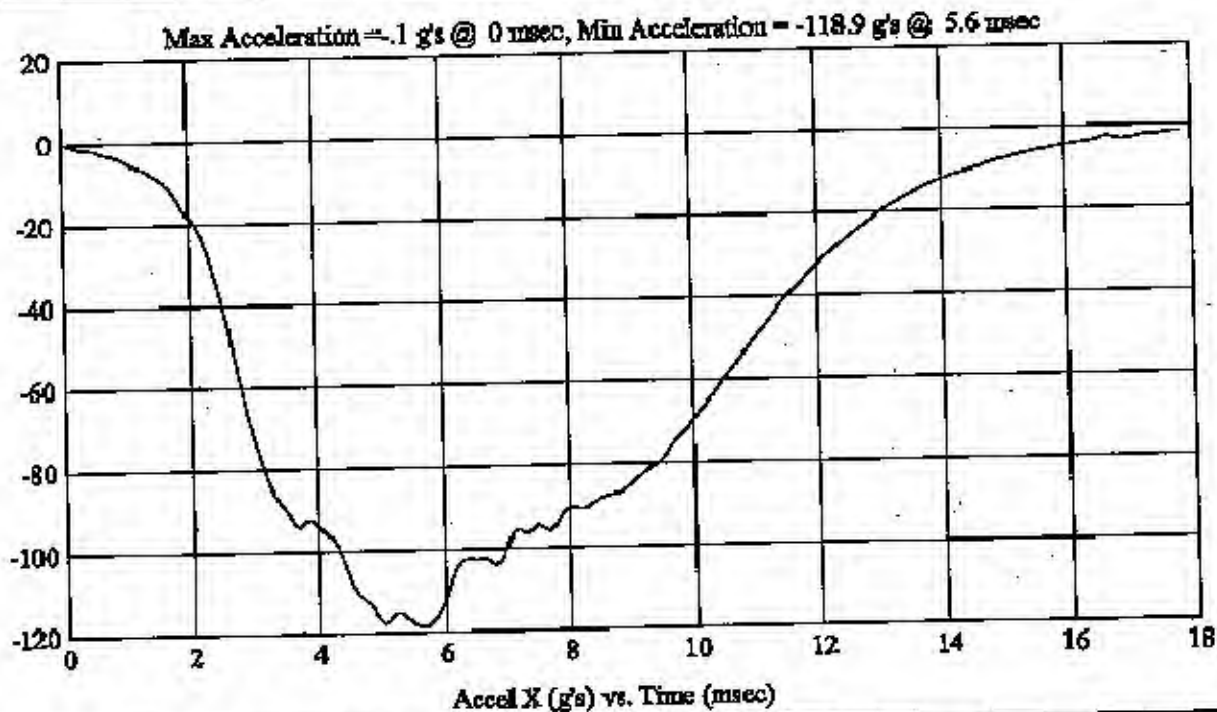
FMH  
G05T7-001.2Customer: Subaru  
Test # 3  
FM4712  
Additional Desc: N/A

Vehicle Program: Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR6  
Vehicle Side: Right  
Horz/Vert Angle: 90/33

HIC(d) = 681, HIC = 683, Delta T = 8.3 msec





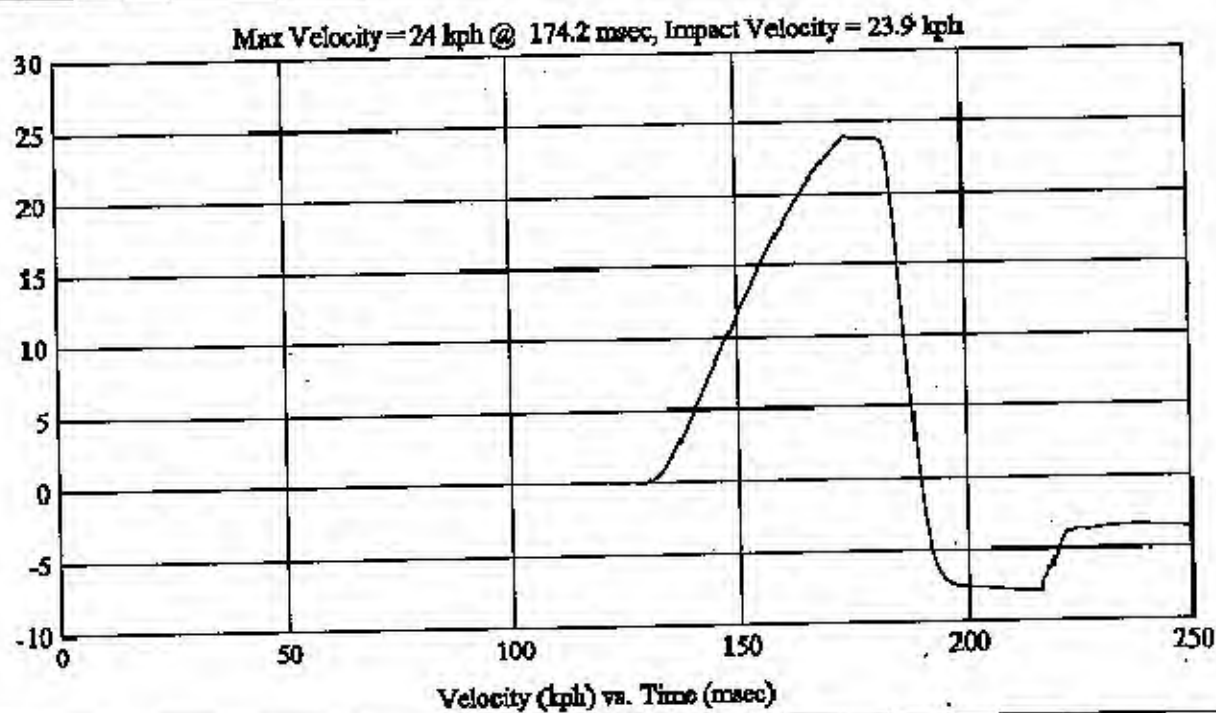
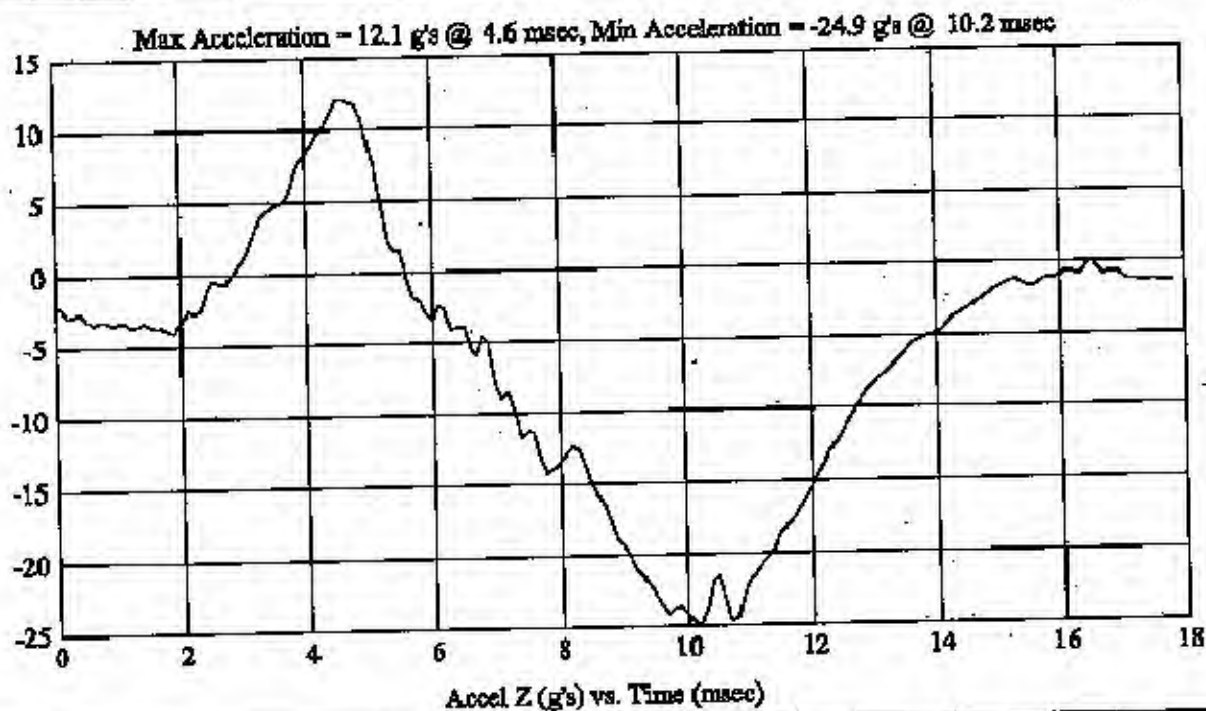
PMF  
G05T7-001.2Customer: Subaru  
Test # 3  
FM4712  
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR6  
Vehicle Side: Right  
Horz/Vert Angle: 90/33

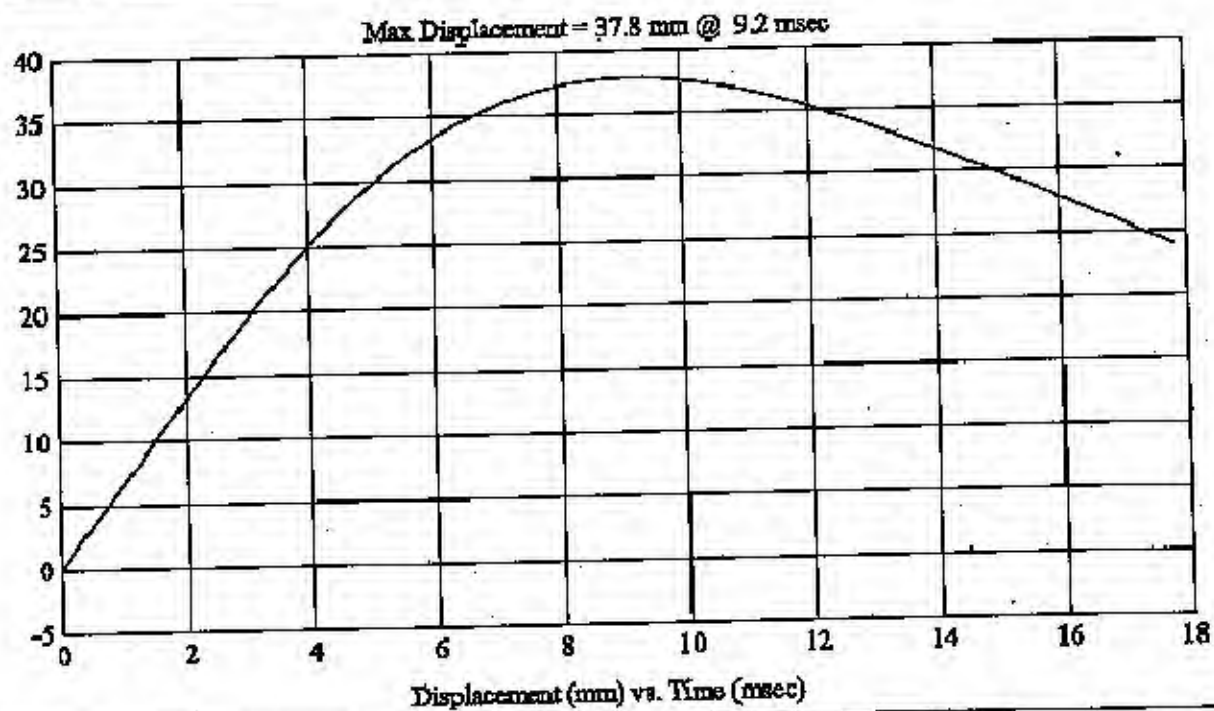
HIC(a) = 681, HIC = 683, Delta T = 8.3 msec



FMH  
G05T7-001.2Customer: Subaru  
Test # 3  
FM4712  
Additional Desc: N/A

Vehicle Program: Outback

Test Date: 11/30/04

Model Year: 2005  
Target: UR6  
Vehicle Side: Right  
Horz/Vert Angle: 90/33 $HIC(\bar{d}) = 681$ ,  $HIC = 683$ ,  $\Delta T = 8.3 \text{ msec}$ 

## 4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

The following section lists the test equipment for the compliance test series. Items marked with an asterisk are calibrated by an external lab. An additional summary table is given for the pre and post-test calibration data for the Free Motion Headforms. The temperature trace to confirm testing was conducted between 66°F and 78°F (19°C - 26°C) is included in Appendix A. Calibration certificates can be found in Appendix B.

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinator	Mitutoyo	PRO 360	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA UTAMA	035 036 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Kodak	RD1000	Record Event	N/A	N/A
*FARO*	Faro Technologies	G08020203122	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Protractor	Stanley N/A Mitutoyo	424 -- Pro 360	Measurement Targeting FMH setup Horizontal Measurement	1 mm N/A 0.5°	Annual
*Vehicle Scale	SW Deluxe	26032360	Weighing Vehicle	± .5 kg	Annual
* Scale	Detecto	AP-20	Weigh FMH Head	± 0.01 lb	Annual
*Temperature Recorder	Dickson	TR320	Record Temperature and Humidity	± 1°C ± 1% RH	Annual



**TABLE 4-2 FMH CALIBRATION SUMMARY DATA SUMMARY TABLE**

FMH Serial #		Weight (lbs)	Temp (°C)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#35	10.02	22.0	30.0	235.6	2.2	Yes
Post	#35	10.02	22.0	31.0	243.3	8.6	Yes
Pre	#36	9.98	22.0	30.0	235.9	2.8	Yes
Post	#36	9.98	22.0	31.0	253.1	12.6	Yes
Pre	#37	9.98	22.0	30.0	260.3	11.5	Yes
Post	#37	9.96	22.0	31.0	264.4	7.5	Yes
Pre	#38	9.92	22.0	30.0	260.1	5.9	Yes
Post	#38	9.92	22.0	31.0	242.1	6.3	Yes

Calibration certificates and headform calibration information can be found in the P572L Performance Calibration report which accompanies this report.

RECORDED BY: David G. Gotwals

DATE: December 2, 2004

APPROVED BY: Helen A. Kaleto

MICHIGAN OPERATIONS  
DATE: 3/20/03  
SUPERCHIEFS: MGATPHDT.5

DOC. NO.: MGATP201UHD  
REVISION NO.: 6  
PAGE 6 OF 7

### HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>035</u>		CALIBRATION DATE: <u>11-30-04</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	235.6
Peak Lateral Acceleration	15 G's Maximum	2.2
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J35924	11-9-04 <sup>BU</sup>	5-9-05
2	ENDEVCO	7264-2000	J35919	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J22664	11-9-04	5-9-05

#### REMARKS:

RECORDED BY: [Signature]

DATE: 11-30-04

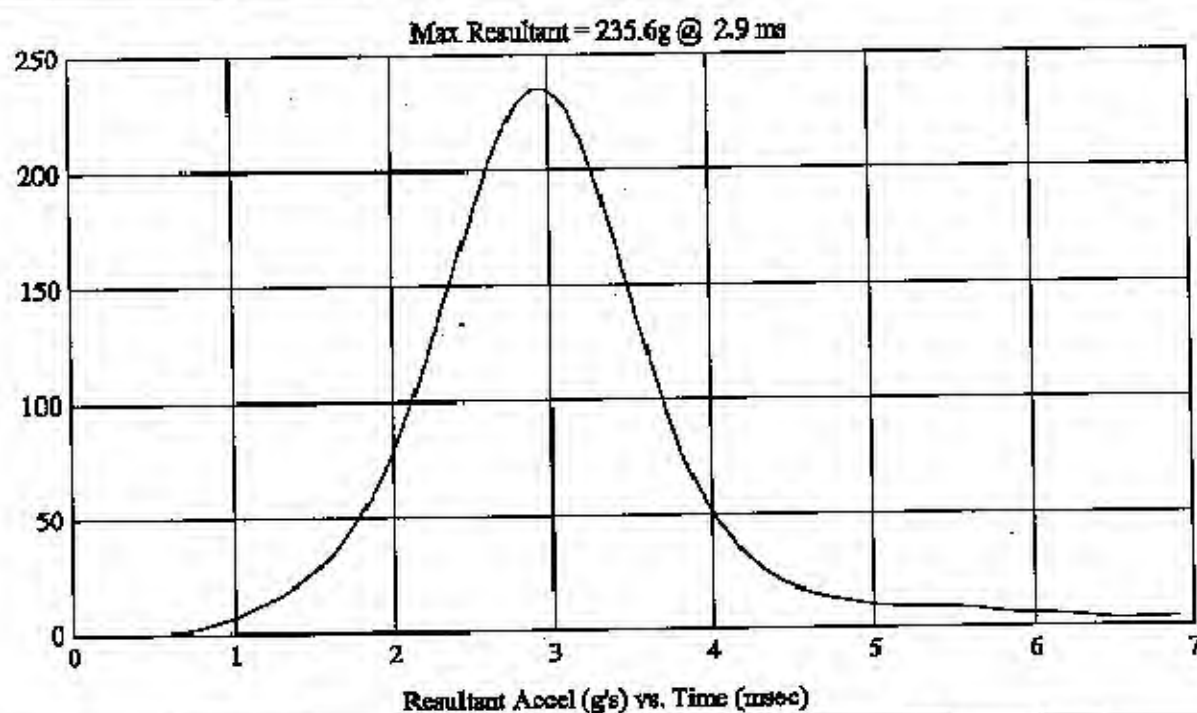
APPROVED BY: [Signature]

Head Drop  
(Preliminary Test Report)

Test Number: H35275  
Test Description: Pre - Test Calibration

MGA Job Number: G05T7-001.2

Test Date: 11/30/04  
Head #: 35



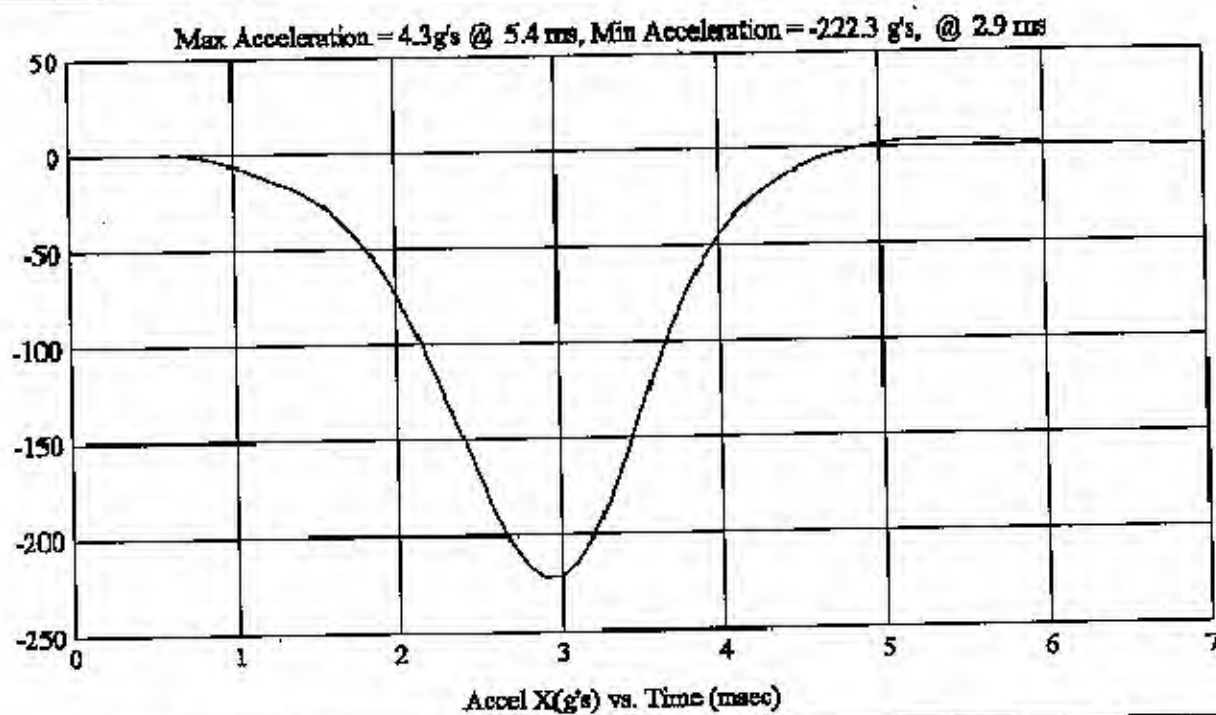
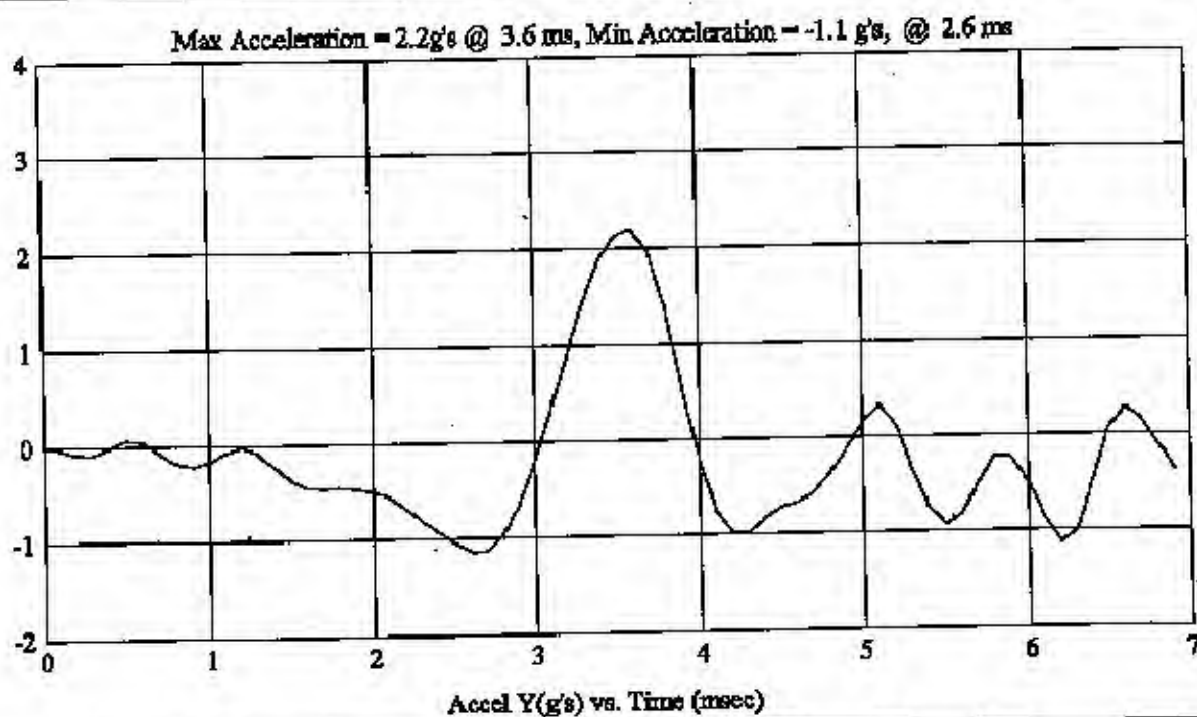


Head Drop  
(Preliminary Test Report)

Test Number: H35275  
Test Description: Pre - Test Calibration

MGA Job Number: G0517-001.2

Test Date: 11/30/04  
Head #: 35



Head Drop  
(Preliminary Test Report)

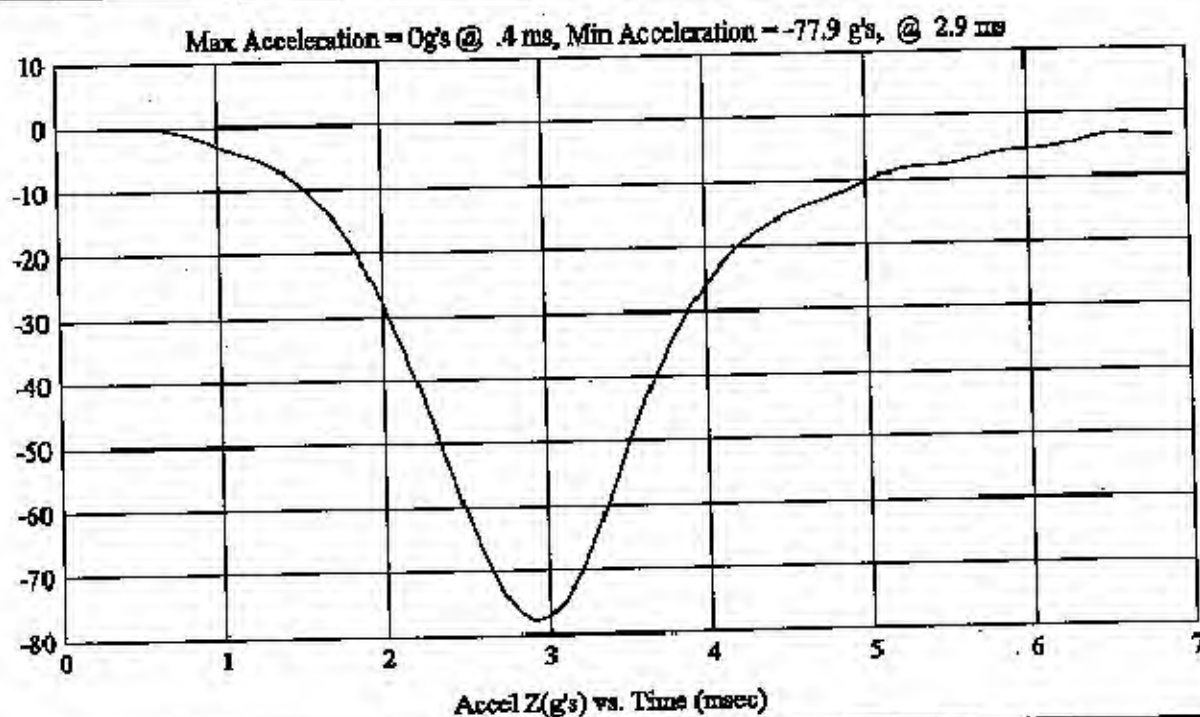
Test Number: H35275

MGA Job Number: G0517-0012

Test Date: 11/30/04

Test Description: Pre - Test Calibration

Head #: 35



MICHIGAN OPERATIONS  
DATE: 3/20/03  
SUPERCEDES: MGATPHDT.3

DOC. NO.: MGATF201UHD  
REVISION NO.: 6  
PAGE 6 OF 7

# HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>035</u>		CALIBRATION DATE: <u>12-2-04</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	243.3
Peak Lateral Acceleration	15 G's Maximum	8.6
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	535924	11-9-04	5-9-05
2	ENDEVCO	7264-2000	535919	11-9-04	5-9-05
3	ENDEVCO	7264-2000	522664	11-9-04	5-9-05

## REMARKS:

RECORDED BY: [Signature]

DATE: 12-2-04

APPROVED BY: [Signature]



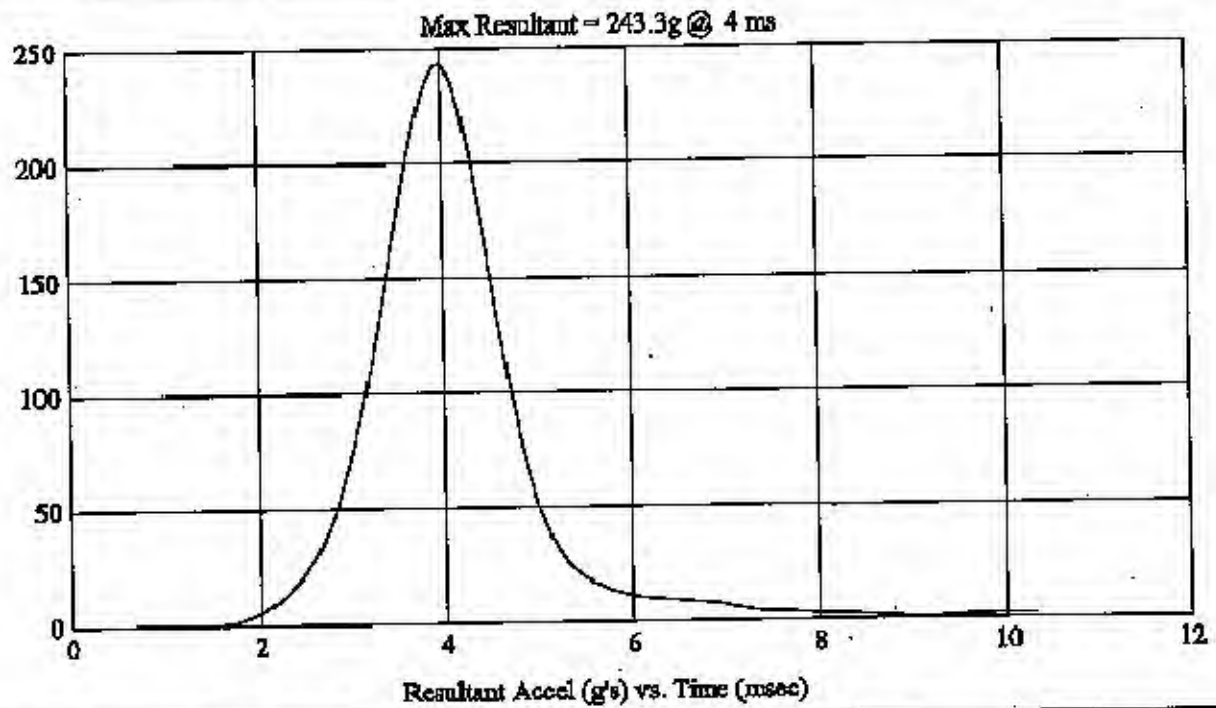
Head Drop  
(Preliminary Test Report)

4-8

Test Number: H35276  
Test Description: Post - Test Calibration

MGA Job Number: G05T7-001.2

Test Date: 12/2/04  
Head #: 35



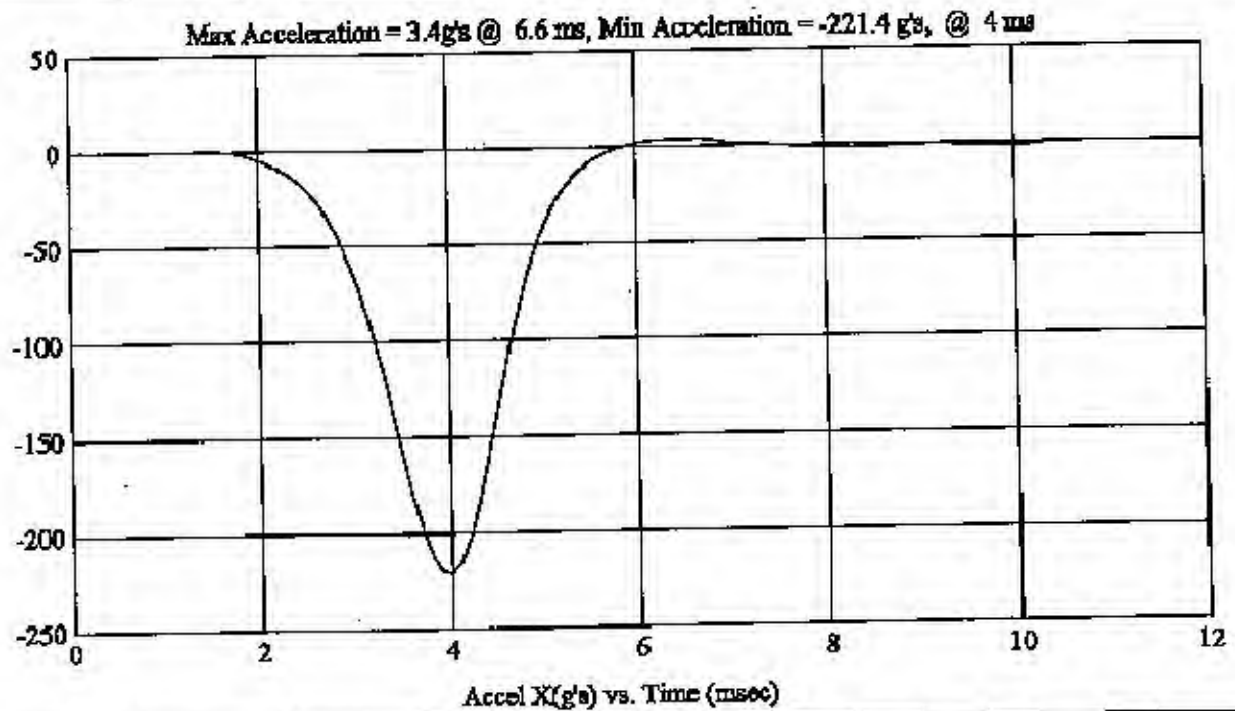
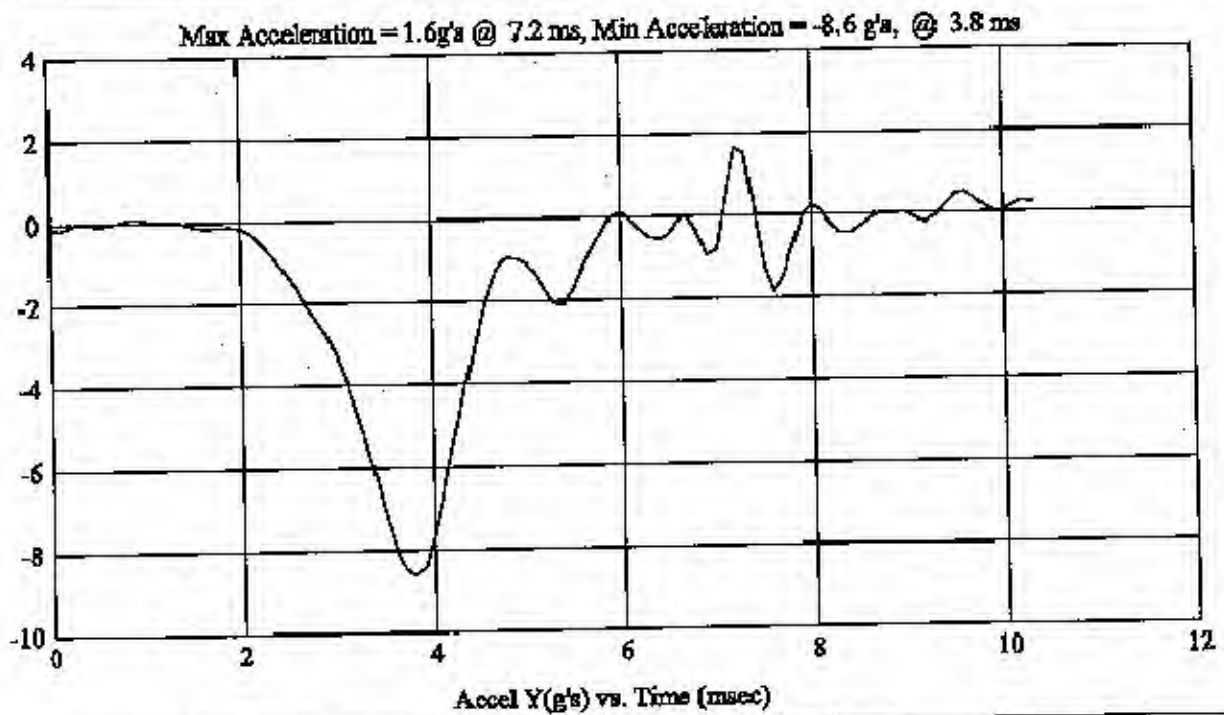
Head Drop  
(Preliminary Test Report)

4-9

Test Number: H35276  
Test Description: Post - Test Calibration

MGA Job Number: G05T7-001.2

Test Date: 12/2/04  
Head #: 35



Head Drop  
(Preliminary Test Report)

4-10

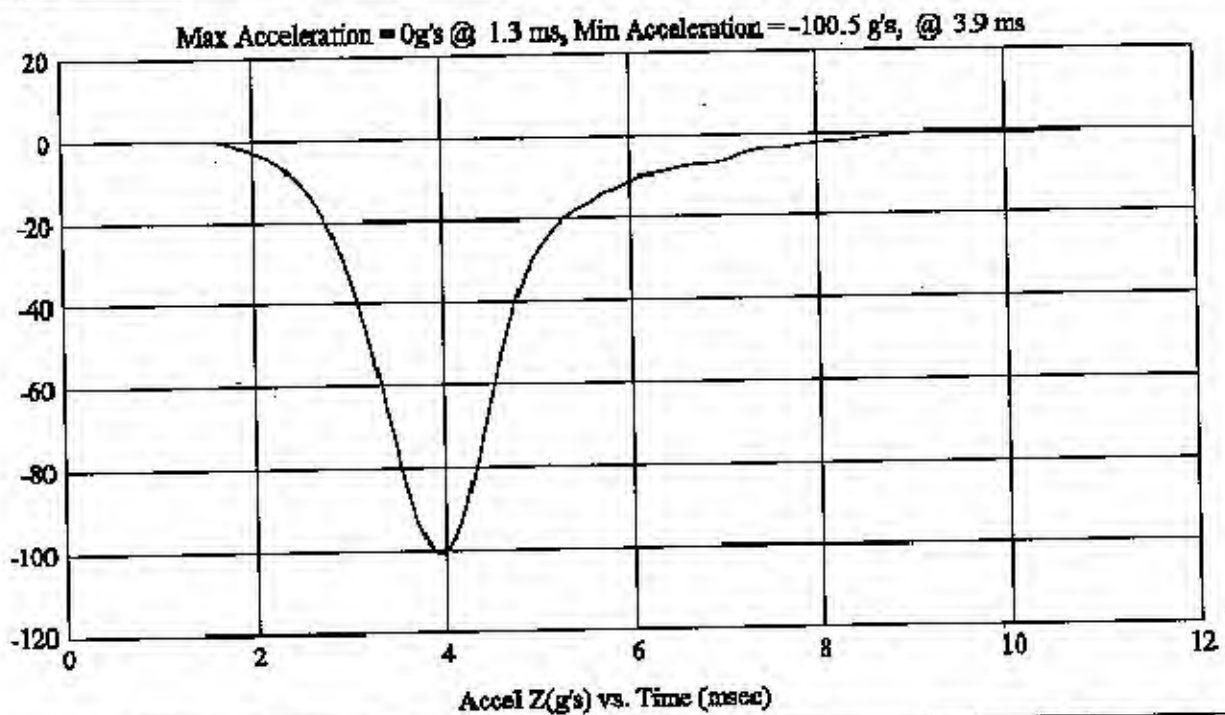
Test Number: H35276

MGA Job Number: G05T7-001.2

Test Date: 12/2/04

Test Description: Post - Test Calibration

Head #: 35





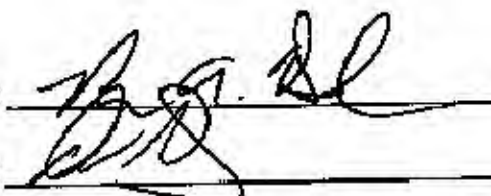
HEAD DROP TEST SUMMARY  
PART 572L

HEADFORM SERIAL NUMBER: 036 CALIBRATION DATE: 11-30-04		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.98
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	235.9
Peak Lateral Acceleration	15 G's Maximum	2.8
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	535923	11-9-04	5-9-05
2	ENDEVCO	7264-2000	535916	11-9-04	5-9-05
3	ENDEVCO	7264-2000	535918	11-9-04	5-9-05

REMARKS:

RECORDED BY:



DATE: 11-30-04

APPROVED BY:

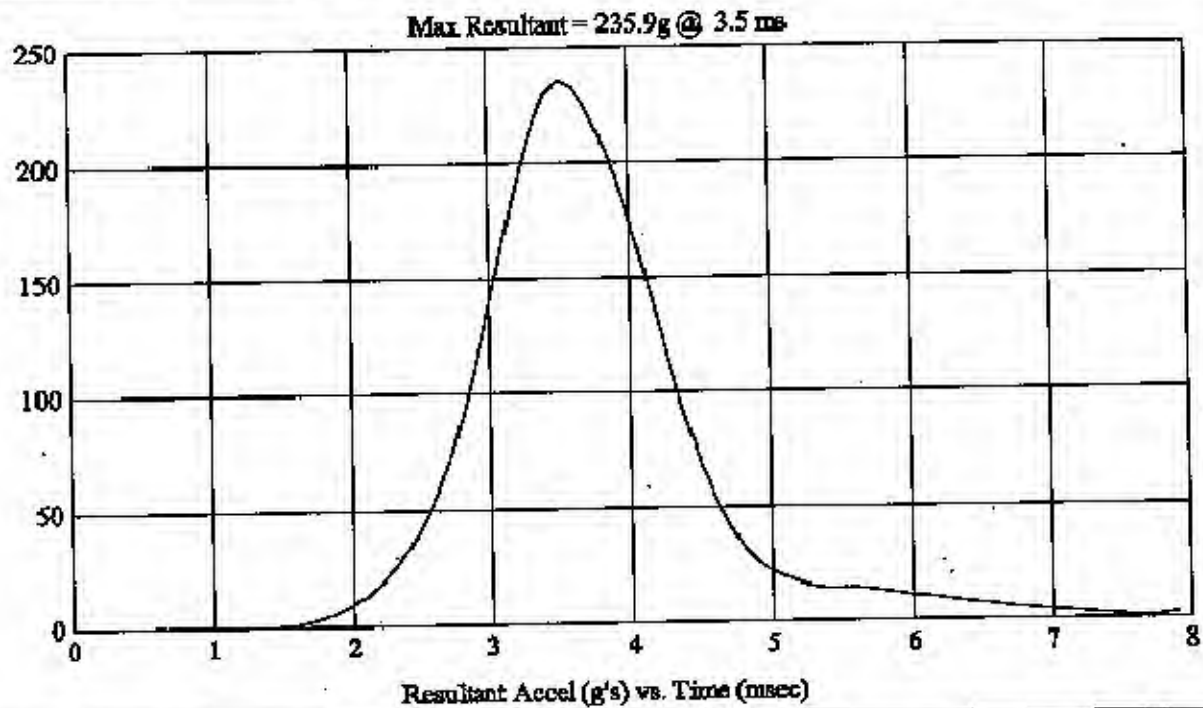
Head Drop  
(Preliminary Test Report)

4-12

Test Number: H36273  
Test Description: Pre - Test Calibration

MGA Job Number: G05T7-0012

Test Date: 11/30/04  
Head #: 36



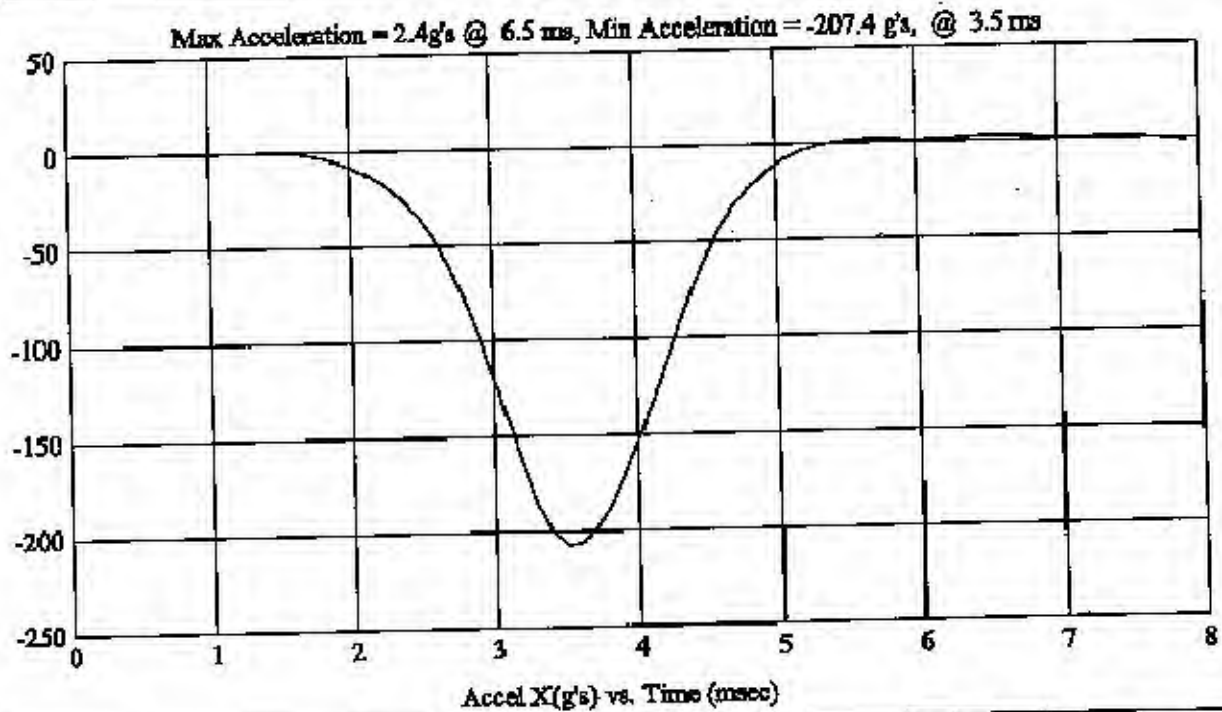
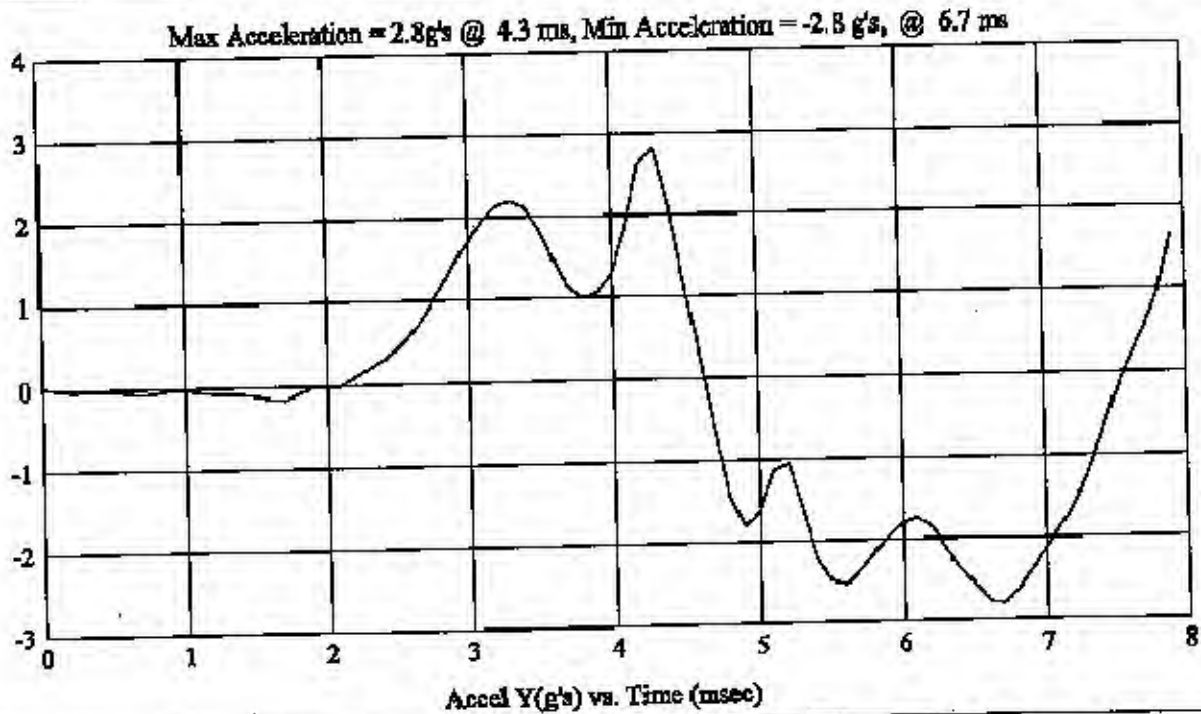
Head Drop  
(Preliminary Test Report)

4-13

Test Number: H36273  
Test Description: Pre - Test Calibration

MGA Job Number: G0517-001.2

Test Date: 11/30/04  
Head #: 35





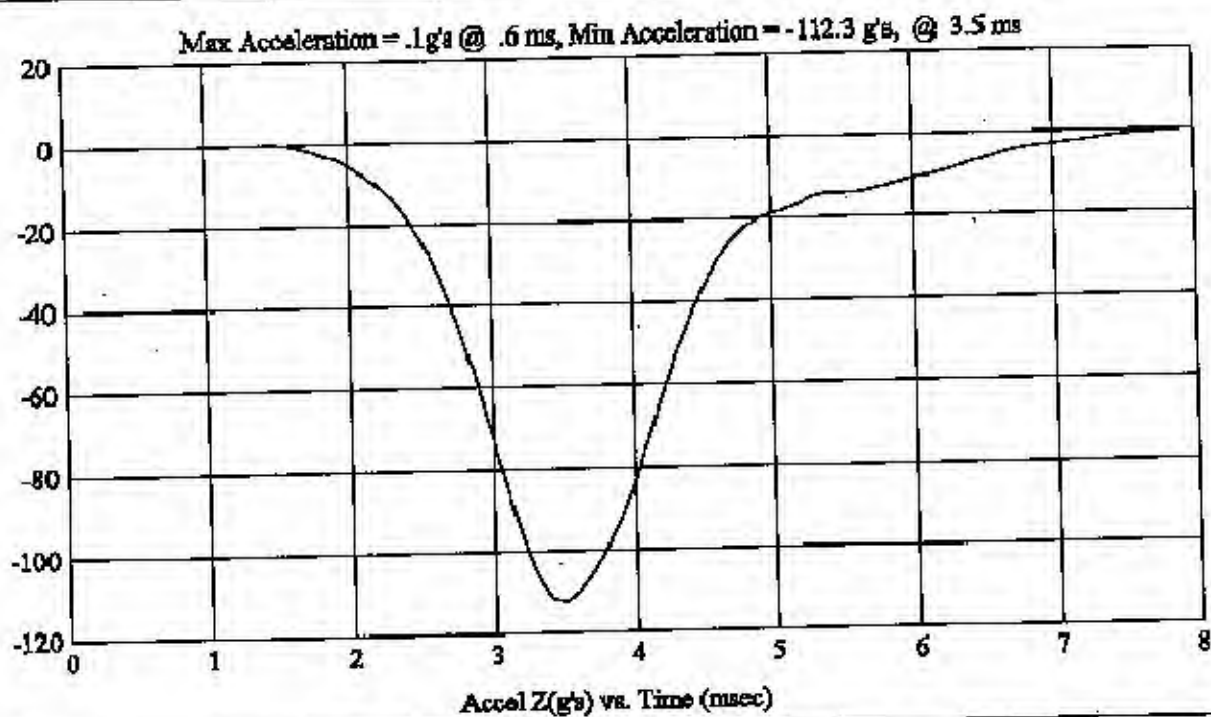
Head Drop  
(Preliminary Test Report)

4-14

Test Number: H36273  
Test Description: Pre - Test Calibration

MGA Job Number: G05T7-0012

Test Date: 11/30/04  
Head #: 36



**HEAD DROP TEST SUMMARY  
PART 572L**

HEADFORM SERIAL NUMBER: <u>036</u>		CALIBRATION DATE: <u>12-2-04</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.98
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	253.1
Peak Lateral Acceleration	15 G's Maximum	12.6
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
	ENDEVCO	7264-2000	J35923	11-9-04	5-9-05
	ENDEVCO	7264-2000	J35916	11-9-04	5-9-05
	ENDEVCO	7264-2000	J35918	11-9-04	5-9-05

REMARKS:

RECORDED BY: [Signature]

DATE: 12-2-04

APPROVED BY: [Signature]

Head Drop  
(Preliminary Test Report)

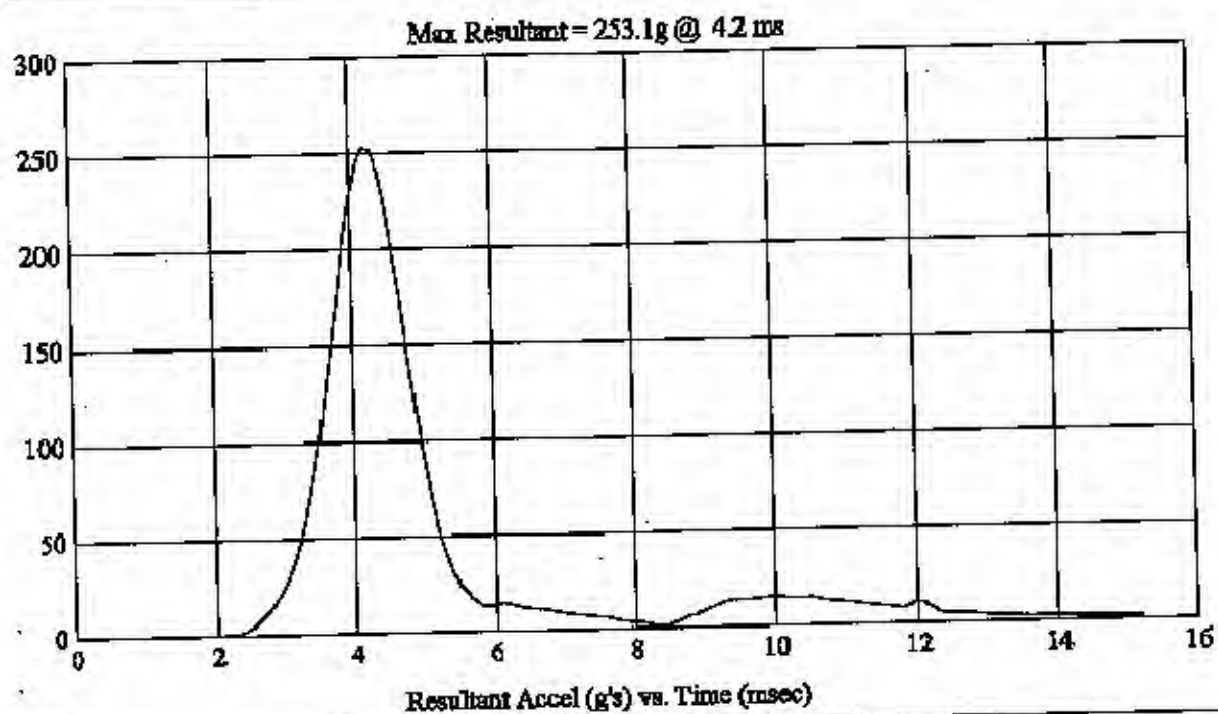
Test Number: H36274

MGA Job Number: G0517-001.2

Test Date: 12/2/04

Test Description: Post - Test Calibration

Head #: 36





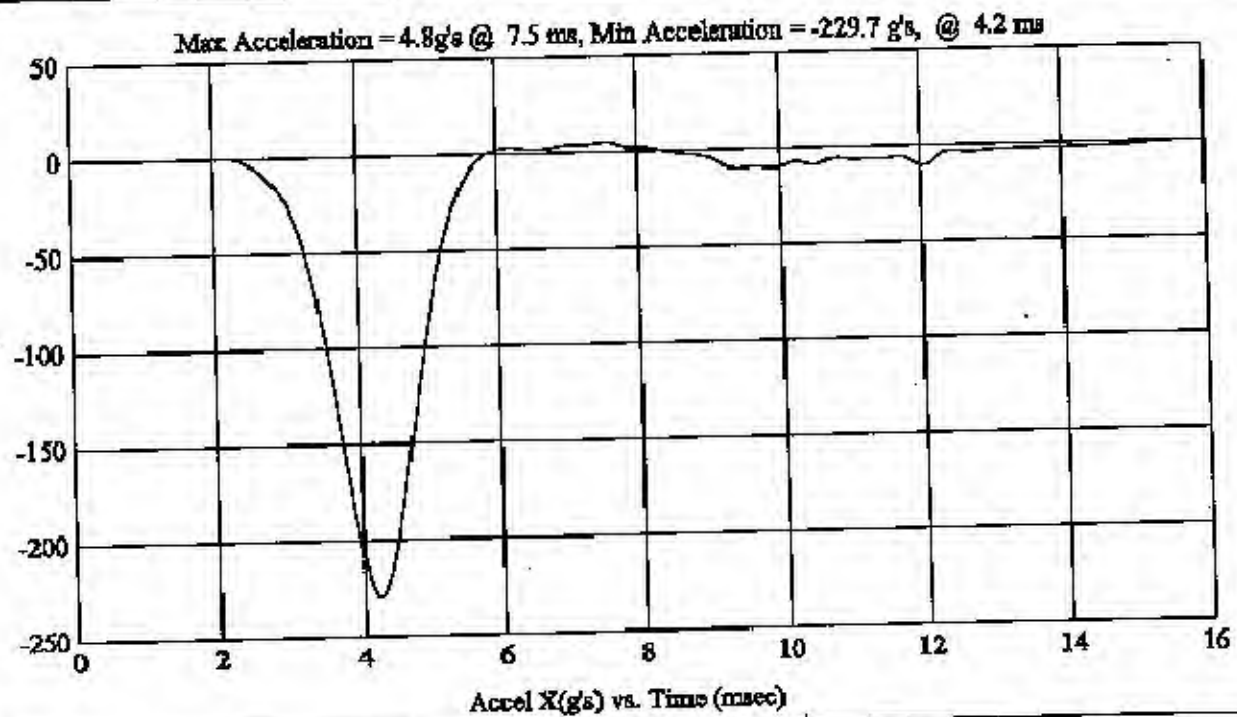
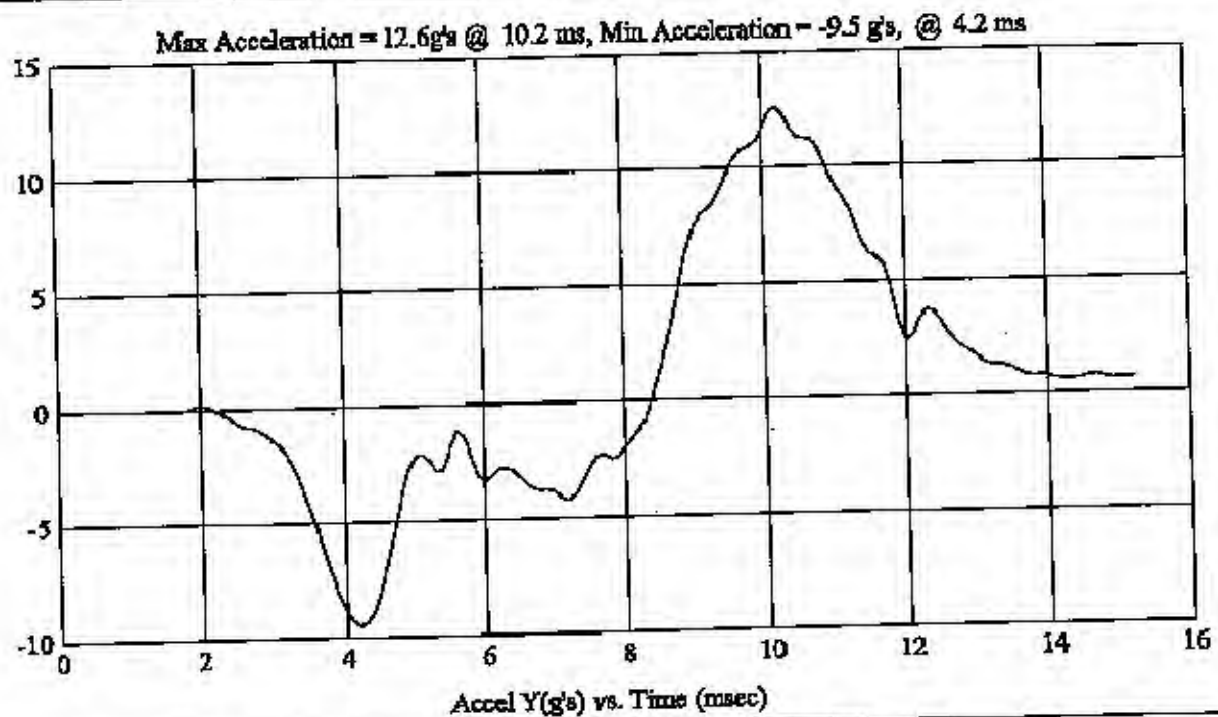
Head Drop  
(Preliminary Test Report)

4-17

Test Number: H36274  
Test Description: Post - Test Calibration

MGA Job Number: G05T7-001.2

Test Date: 12/2/04  
Head #: 36



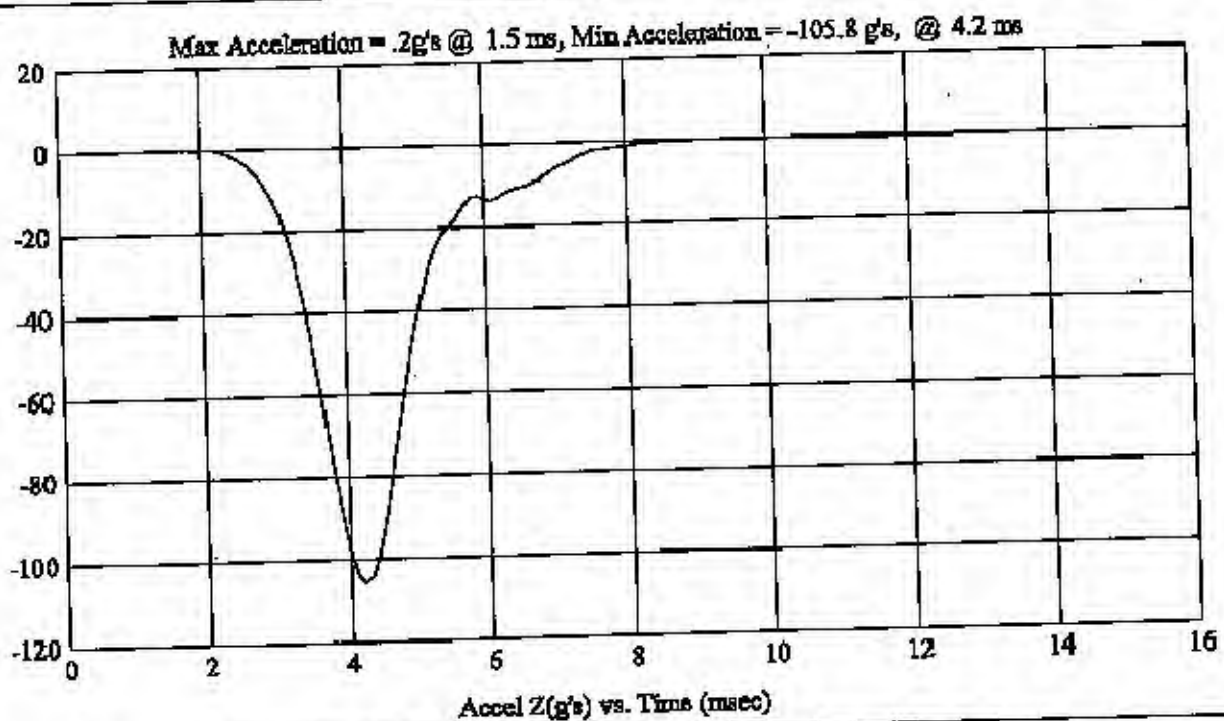
Head Drop  
(Preliminary Test Report)

4-18

Test Number: H36274  
Test Description: Post - Test Calibration

MGA Job Number: G0517-0012

Test Date: 12/2/04  
Head #: 36



HEAD DROP TEST SUMMARY  
PART 572L

HEADFORM SERIAL NUMBER: <u>037</u> CALIBRATION DATE: <u>11-30-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	260.3
Peak Lateral Acceleration	15 G's Maximum	11.5
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J35800	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J35841	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J35791	11-9-04	5-9-05

REMARKS:

RECORDED BY: [Signature] DATE: 11-30-04  
APPROVED BY: [Signature]



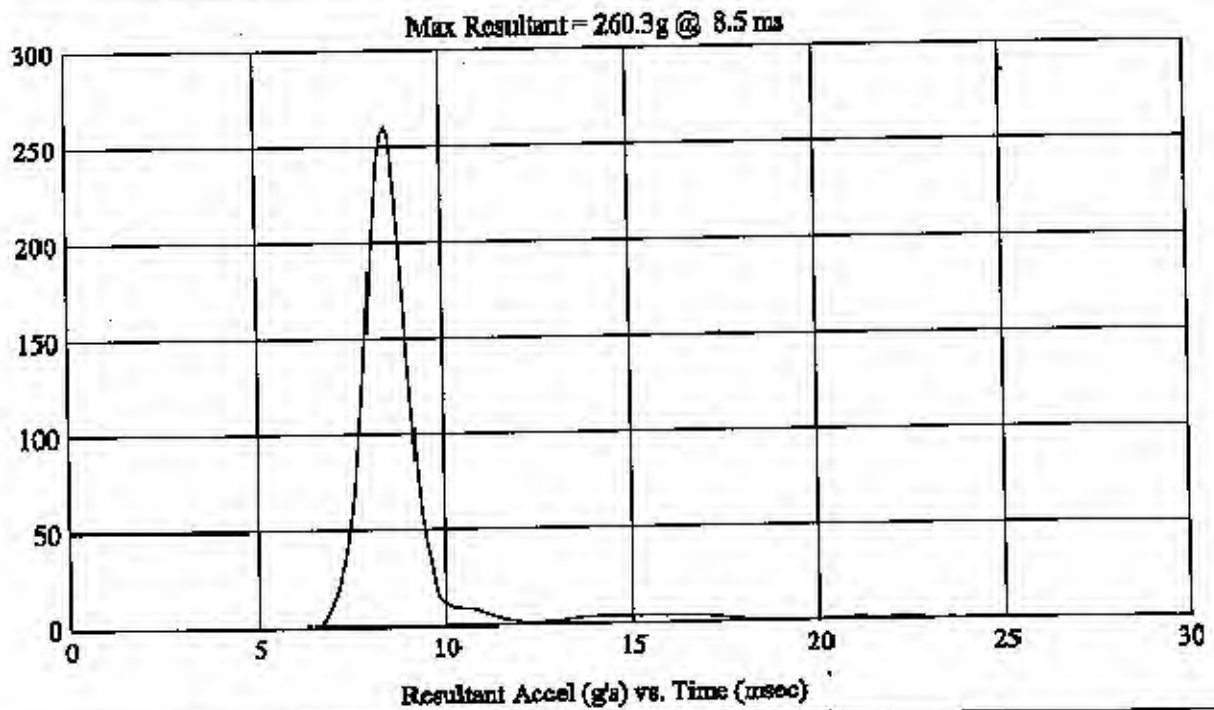
Head Drop  
(Preliminary Test Report)

4-20

Test Number: H37146  
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

Test Date: 11/30/04  
Head #: 37



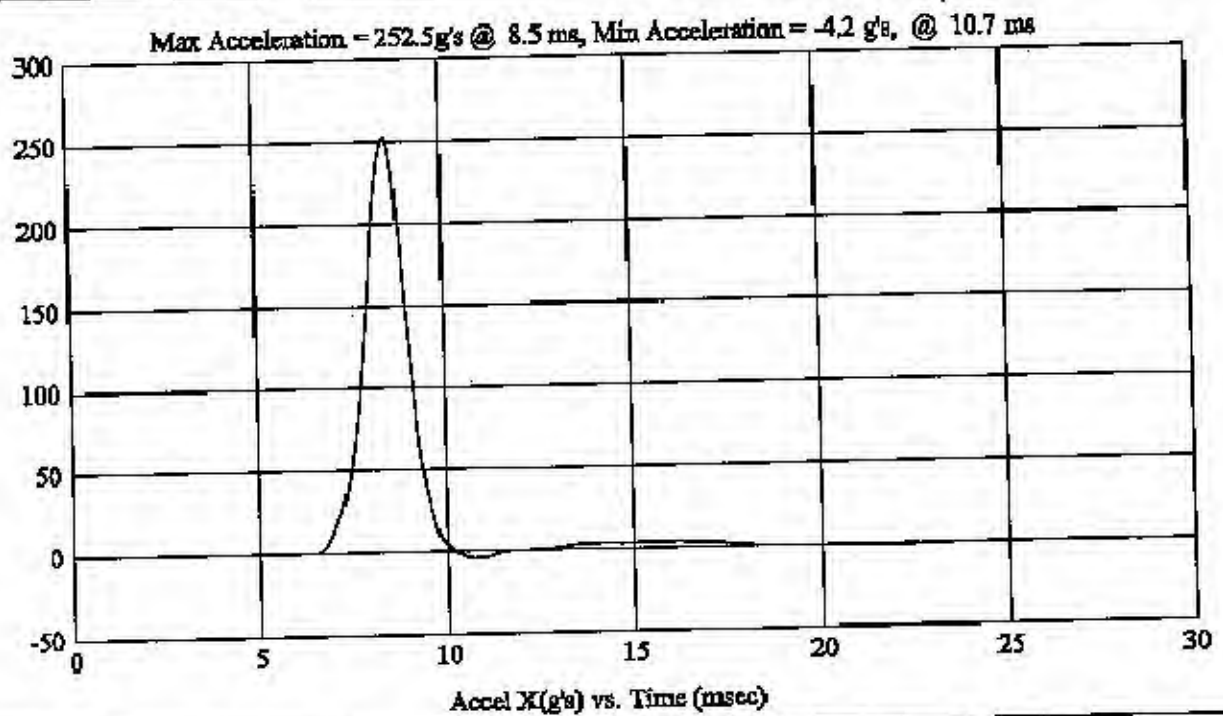
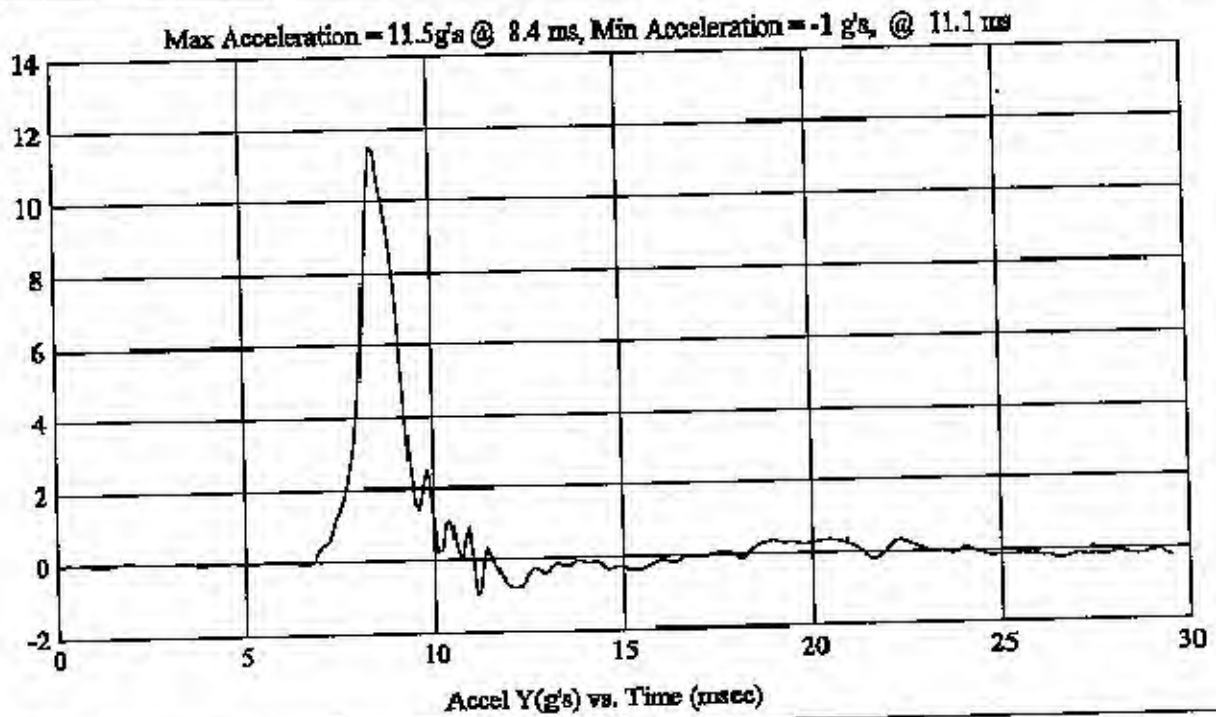
Head Drop  
(Preliminary Test Report)

4-21

Test Number: H37146  
Test Description: Pre - Test Calibration

MGA Job Number: G04L7-001.2

Test Date: 11/30/04  
Head #: 37



Head Drop  
(Preliminary Test Report)

4-22

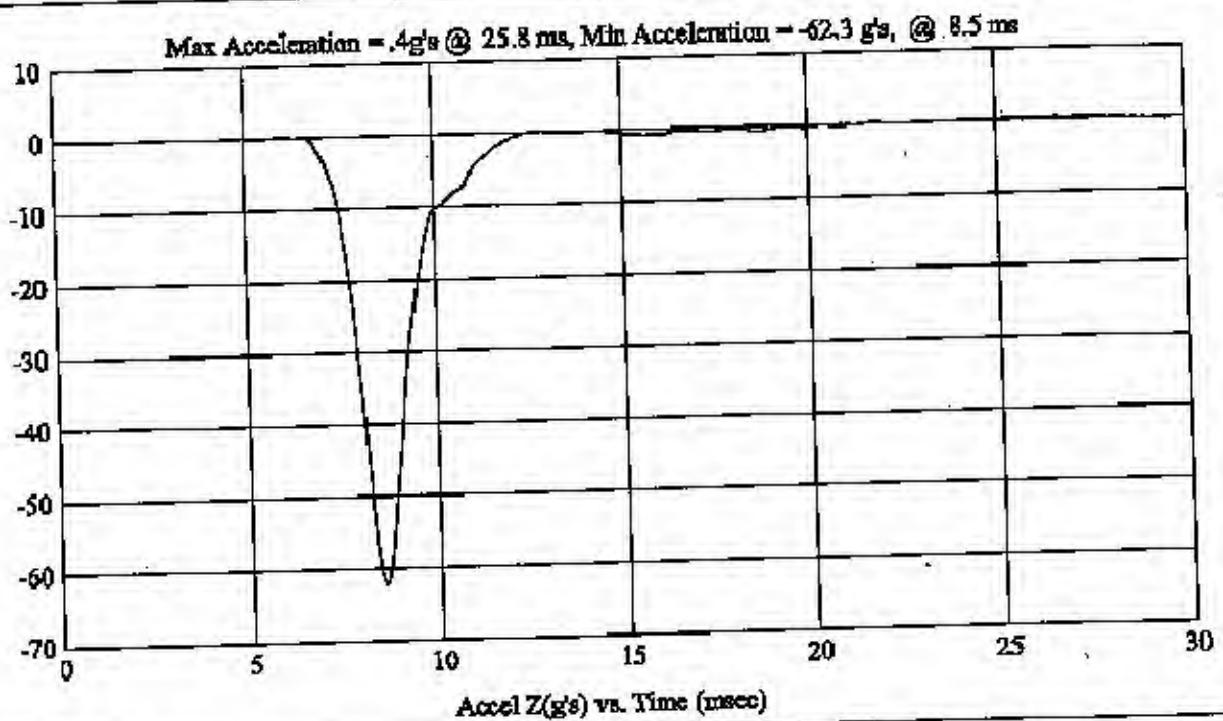
Test Number: E37146

MGA Job Number: G0417-001.2

Test Date: 11/30/04

Test Description: Pre - Test Calibration

Head #: 37





HEAD DROP TEST SUMMARY  
PART 572L

HEADFORM SERIAL NUMBER: 037 CALIBRATION DATE: 12-2-04		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	254.4 <del>253.7</del> 24
Peak Lateral Acceleration	15 G's Maximum	24 7.5
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	535800	11-9-04	5-9-05
2	ENDEVCO	7264-2000	535841	11-9-04	5-9-05
3	ENDEVCO	7264-2000	535791	11-9-04	5-9-05

REMARKS:

RECORDED BY:

DATE: 12-2-04

APPROVED BY:

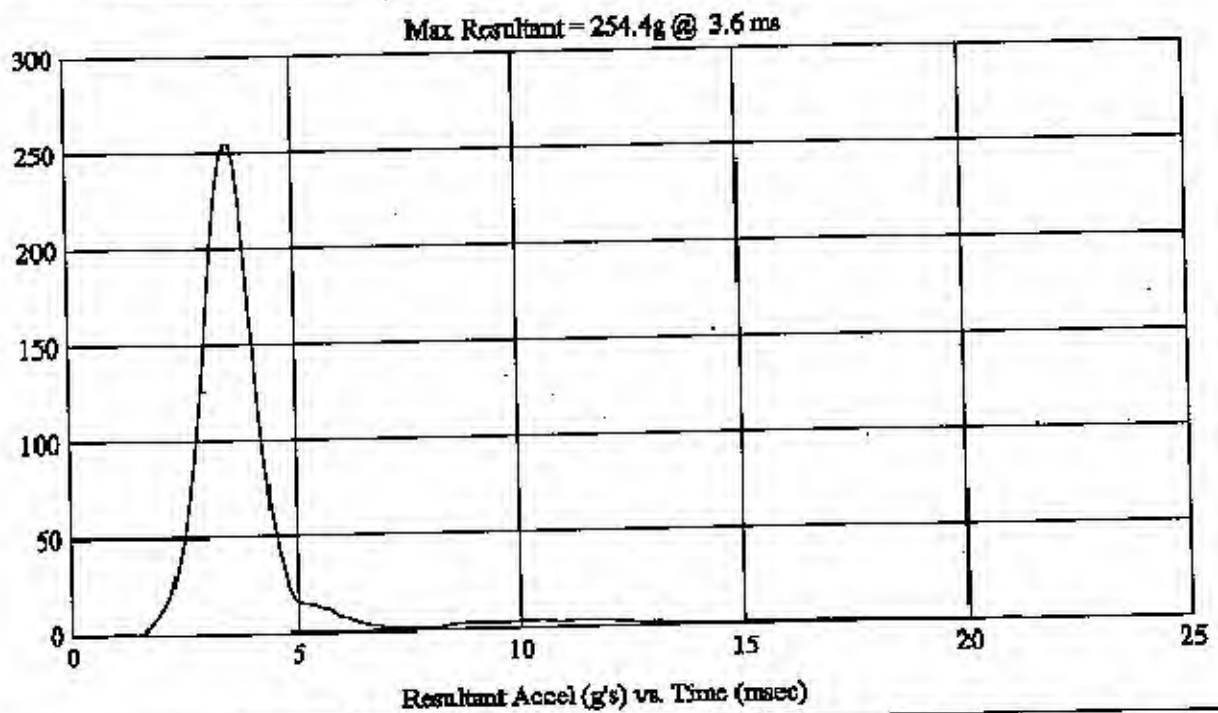
Head Drop  
(Preliminary Test Report)

4-24

Test Number: H37147  
Test Description: Post - Test Calibration

MGA Job Number: G0517-0012

Test Date: 12/2/04  
Head #: 37



Head Drop  
(Preliminary Test Report)

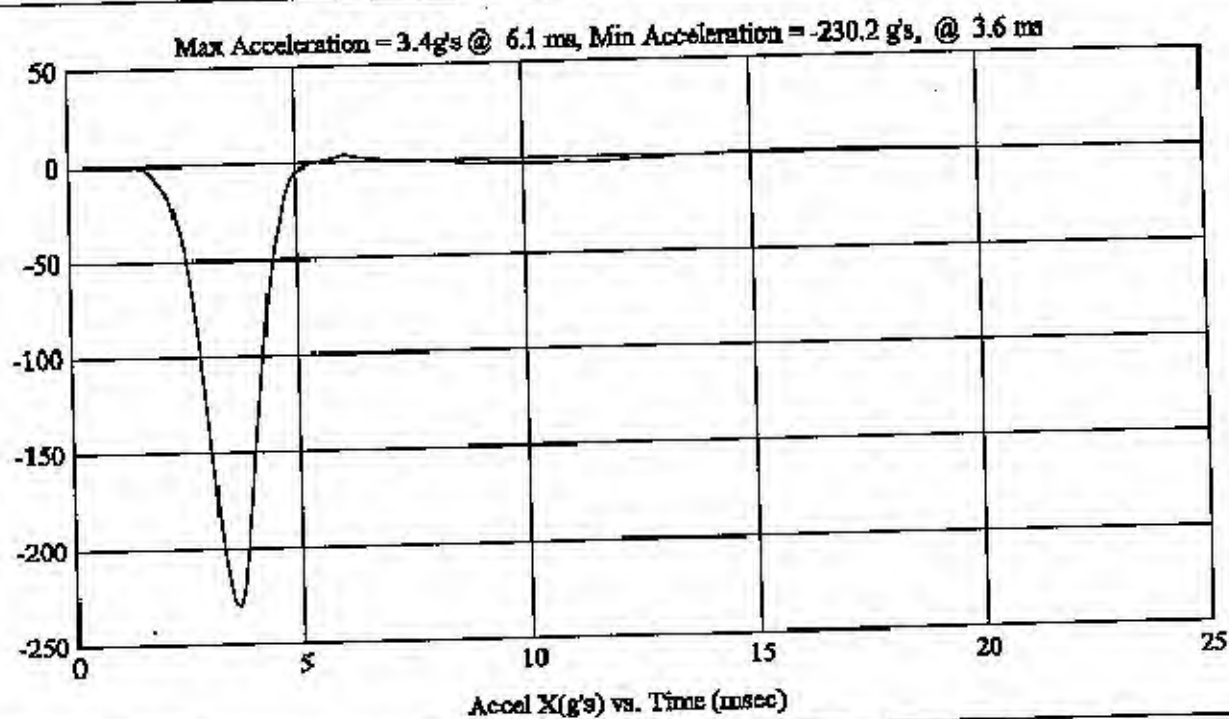
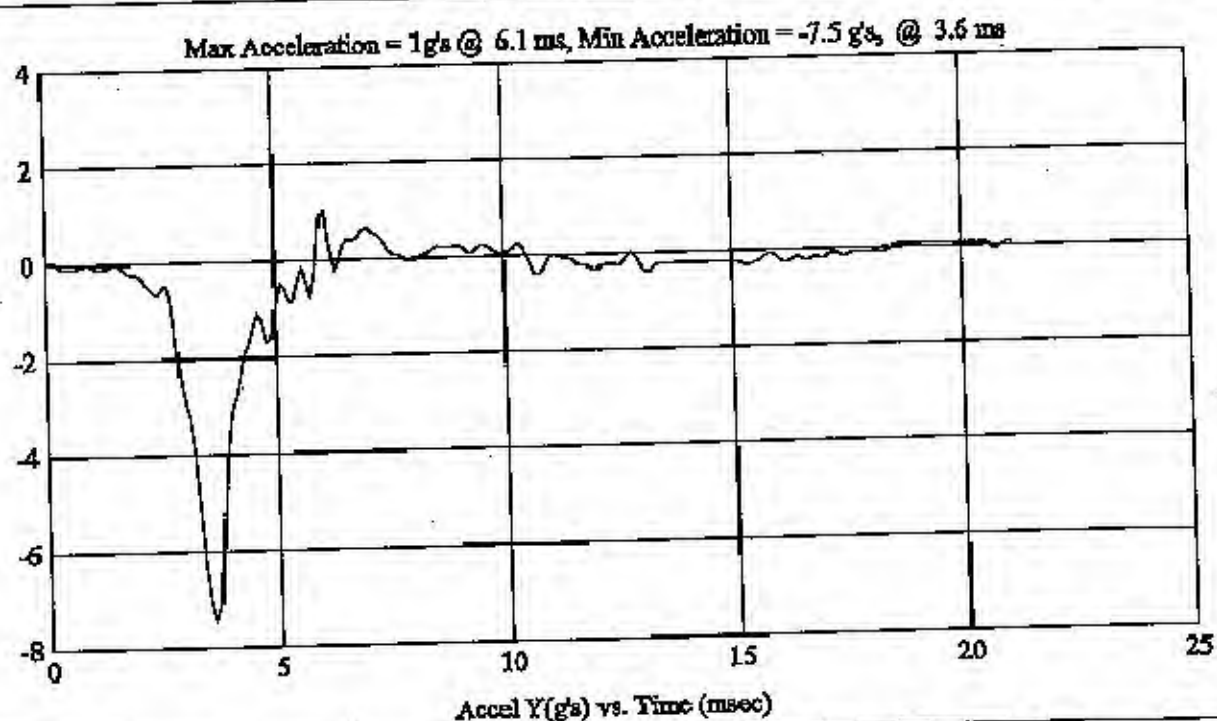
Test Number: H37147

MGA Job Number: G05E7-001.2

Test Date: 12/2/04

Test Description: Post - Test Calibration

Head #: 37





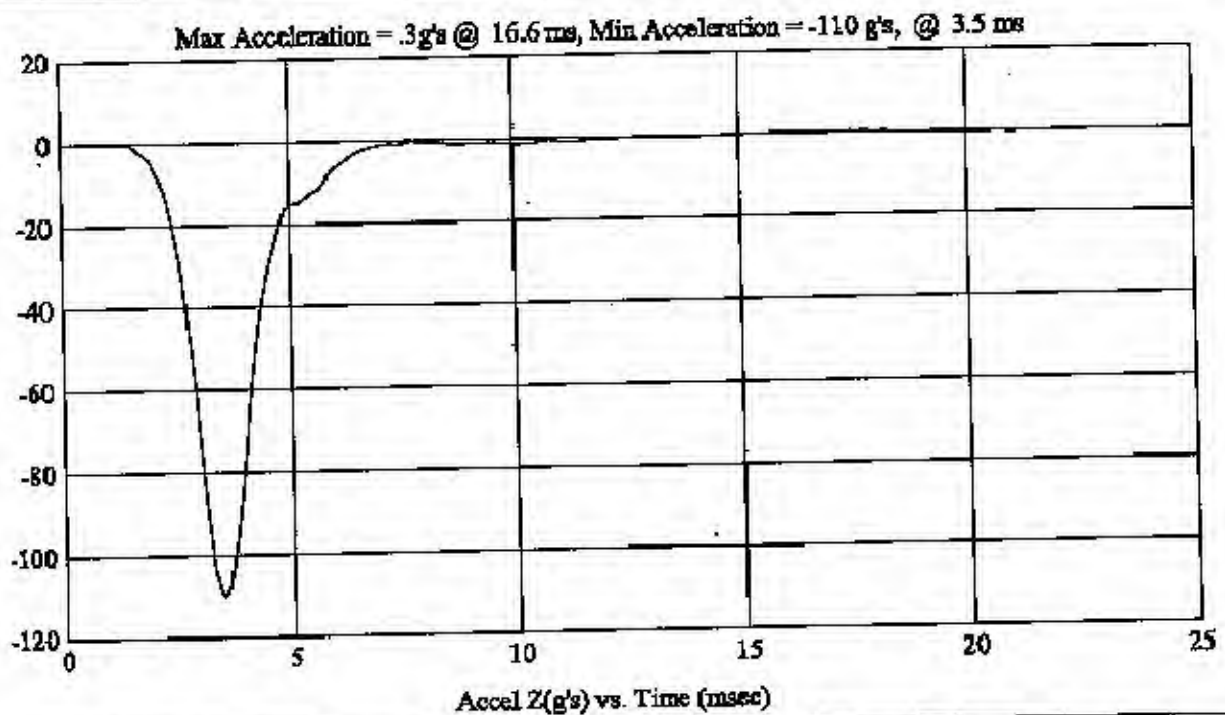
Head Drop  
(Preliminary Test Report)

4-28

Test Number: H37147  
Test Description: Post - Test Calibration

MGA Job Number: G0517-001.2

Test Date: 12/2/04  
Head #: 37



HEAD DROP TEST SUMMARY  
PART 572L

HEADFORM SERIAL NUMBER: <u>038</u>		CALIBRATION DATE: <u>11-30-04</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	250.1
Peak Lateral Acceleration	15 G's Maximum	5.9
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J36197	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J36193	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J36353	11-9-04	5-9-05

REMARKS:

RECORDED BY: 

DATE: 11-30-04

APPROVED BY: 

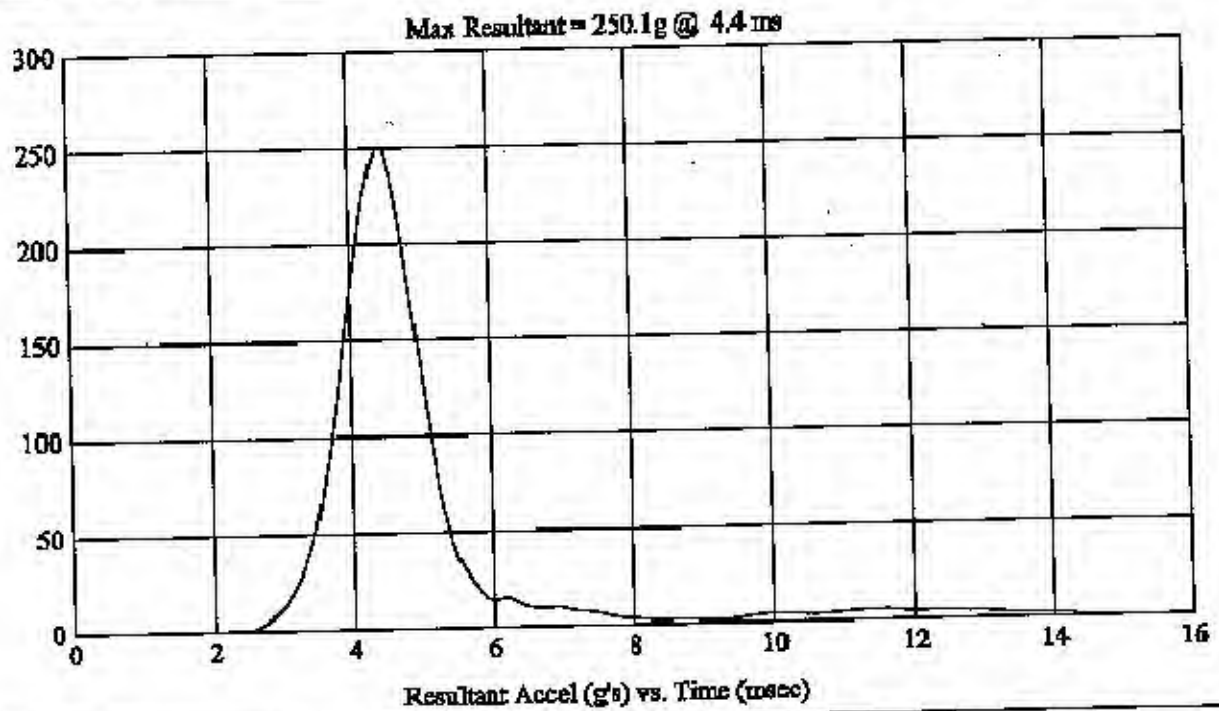
Head Drop  
(Preliminary Test Report)

4-28

Test Number: H38256  
Test Description: Pre - Test Calibration

MGA Job Number: G0417-001.2

Test Date: 11/30/04  
Head #: 38





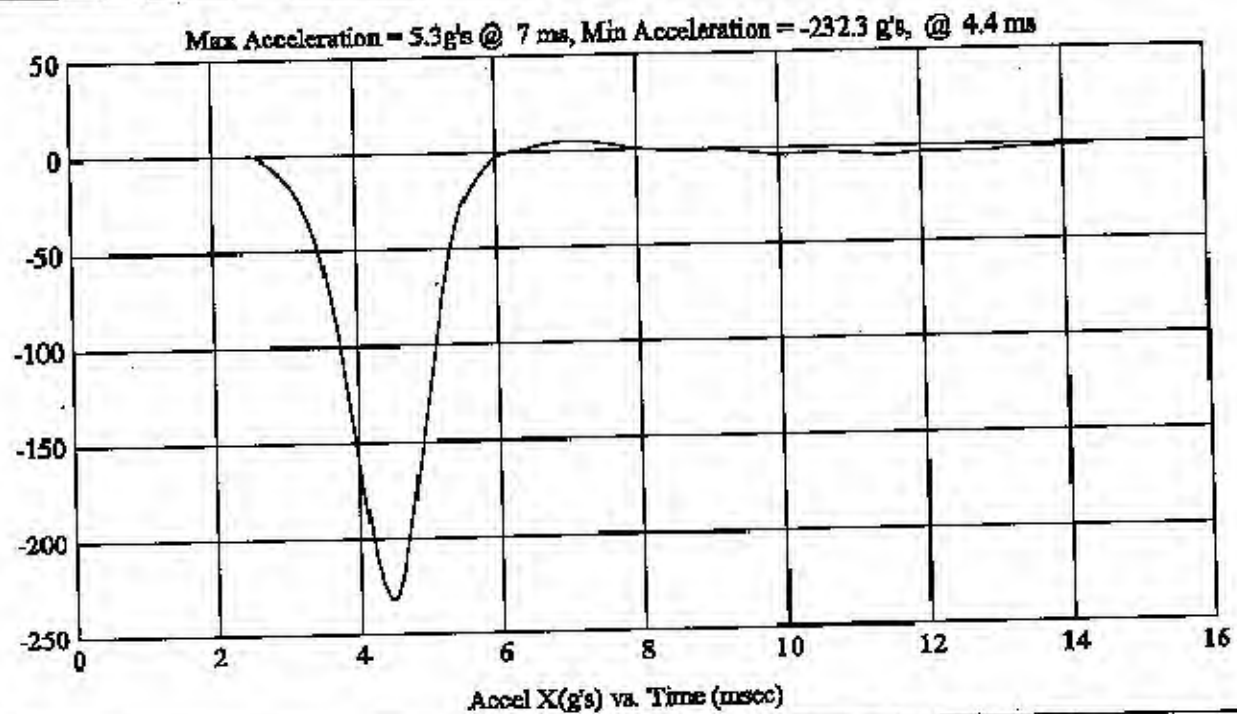
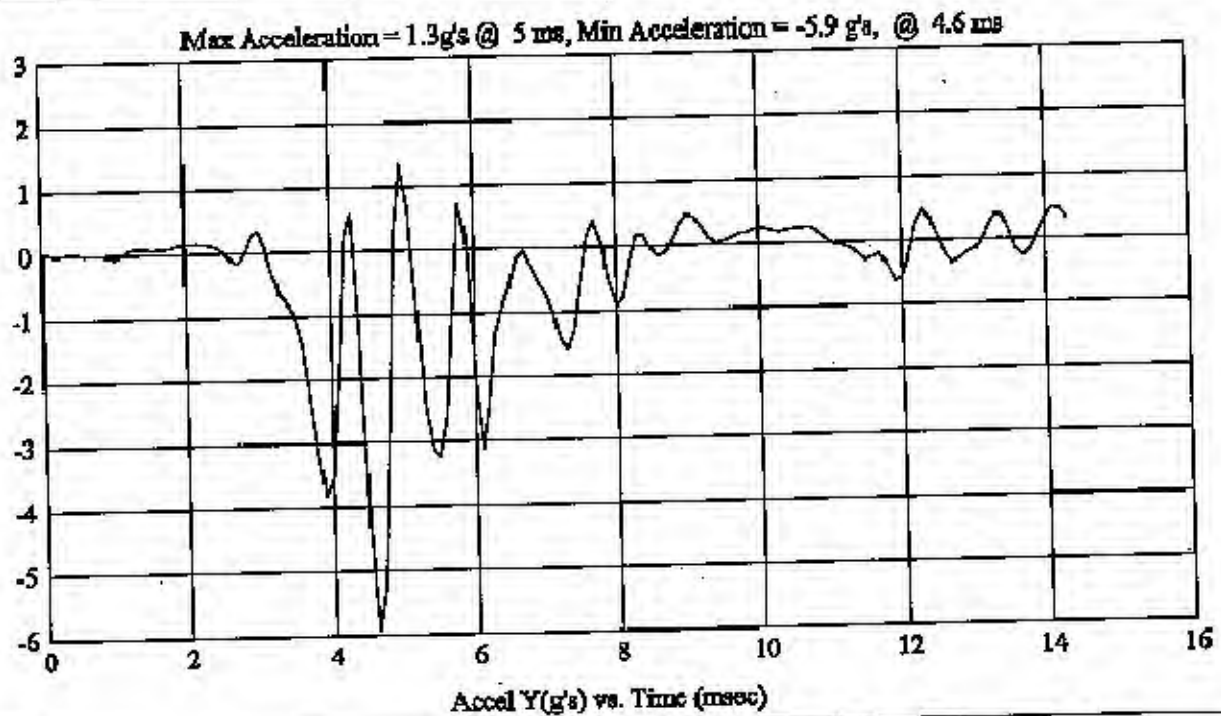
Head Drop  
(Preliminary Test Report)

4-29

Test Number: H38256  
Test Description: Pre - Test Calibration

MGA Job Number: G0417-001.2

Test Date: 11/30/04  
Head #: 38



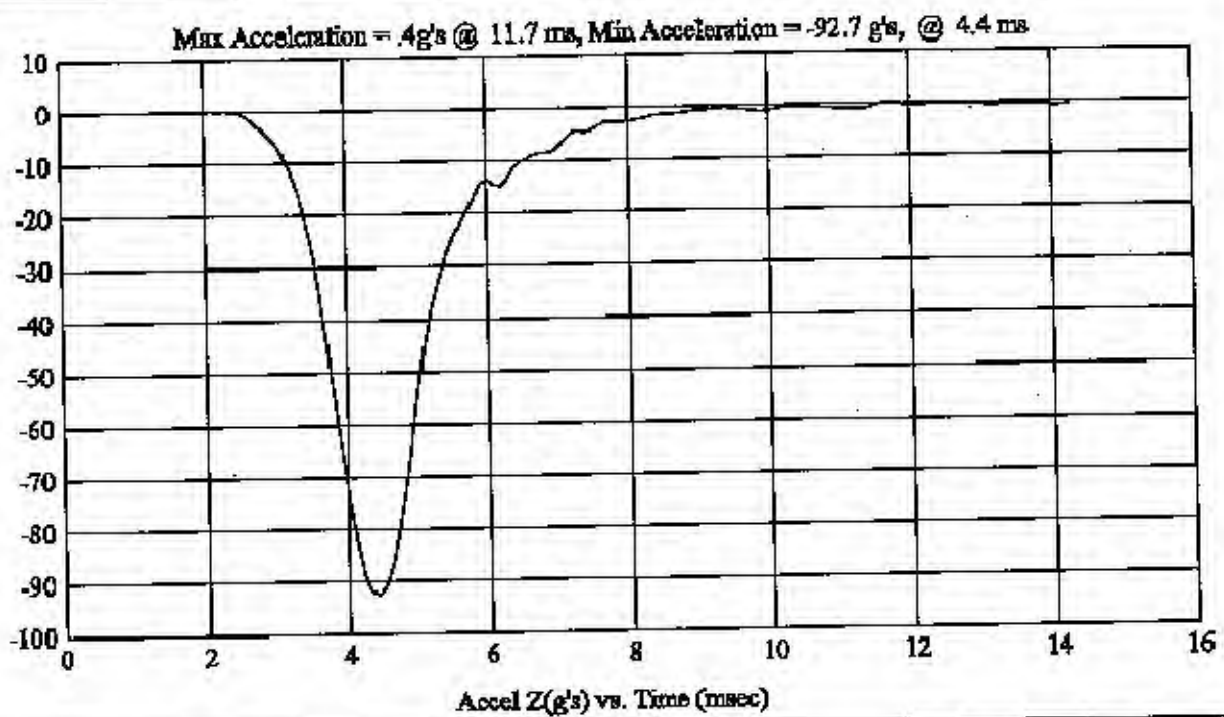
Head Drop  
(Preliminary Test Report)

4-30

Test Number: H38256  
Test Description: Pre - Test Calibration

MGA Job Number: G04E7-001.2

Test Date: 11/30/04  
Head #: 38



MICHIGAN OPERATIONS  
DATE: 3/20/03  
SUPERCHDS: MGA17PHDT.5

DOC. NO.: MGA17201UHD  
REVISION NO.: 6  
PAGE 6 OF 7

### HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>036</u>		CALIBRATION DATE: <u>12-2-04</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	242.1
Peak Lateral Acceleration	15 G's Maximum	6.3
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	536197	11-9-04	5-9-05
2	ENDEVCO	7264-2000	536193	11-9-04	5-9-05
3	ENDEVCO	7264-2000	536353	11-9-04	5-9-05

#### REMARKS:

RECORDED BY: *[Signature]*  
APPROVED BY: *[Signature]*

DATE: 12-2-04



Head Drop  
(Preliminary Test Report)

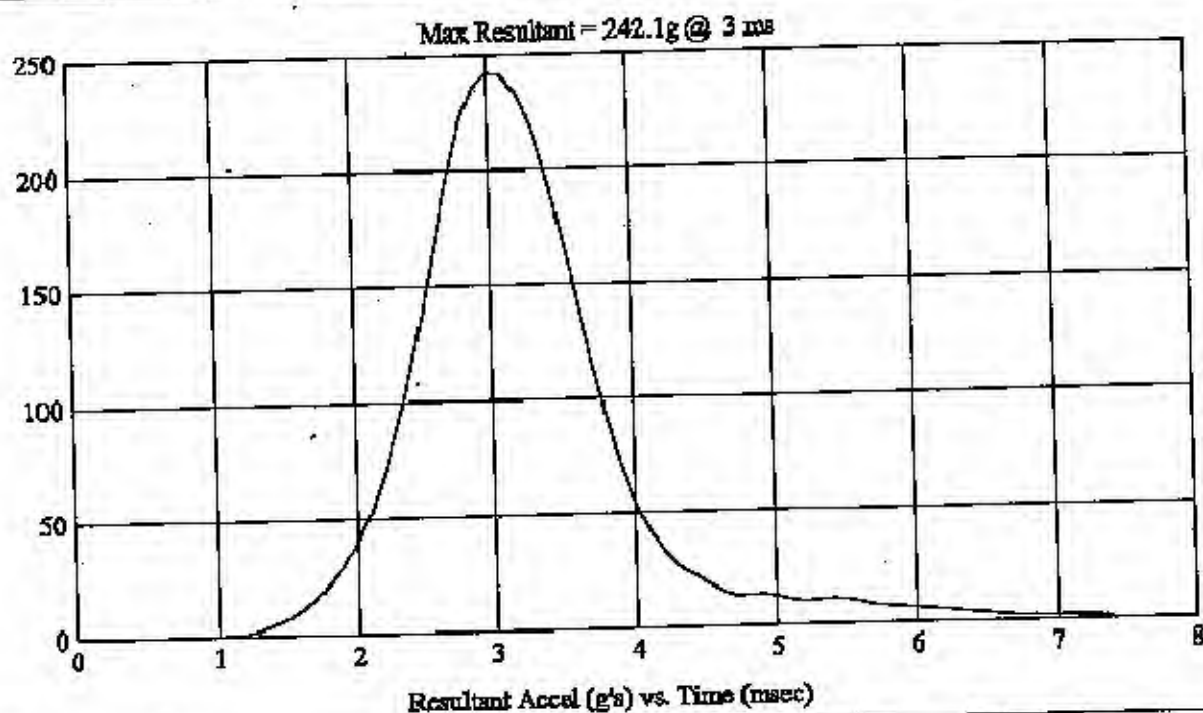
Test Number: H38257

MGA Job Number: G05T7-001.2

Test Date: 12/2/04

Test Description: Post - Test Calibration

Head #: 38



Head Drop  
(Preliminary Test Report)

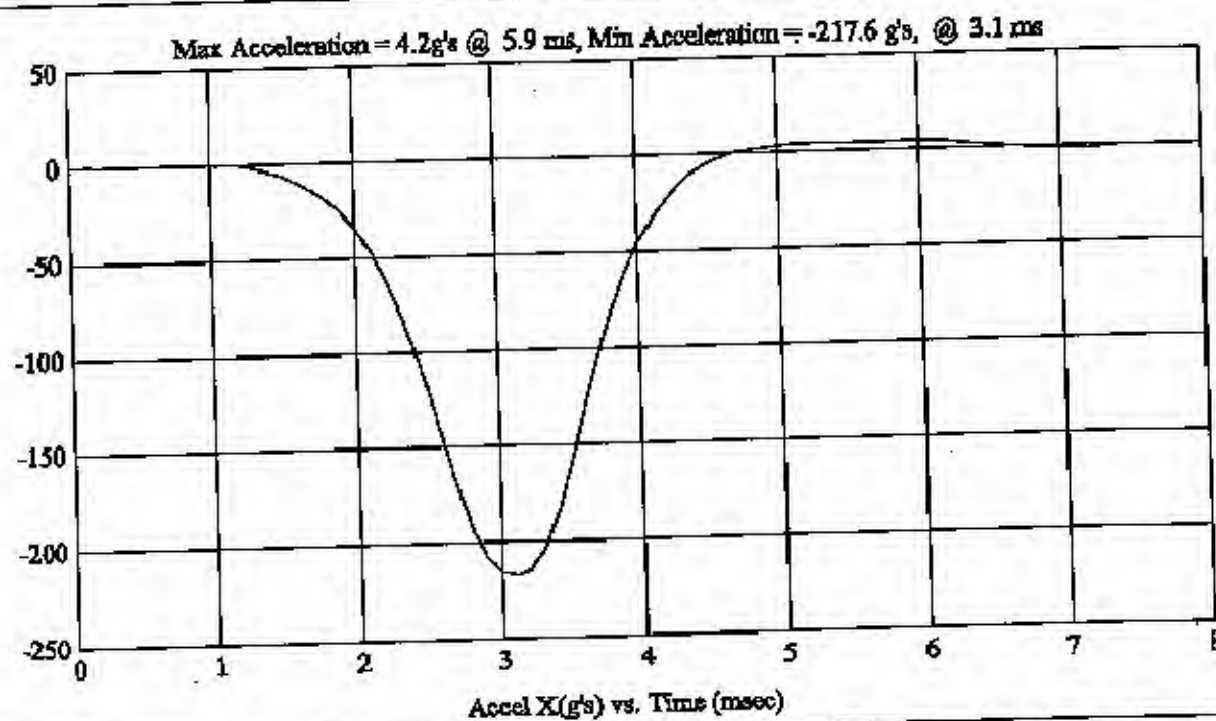
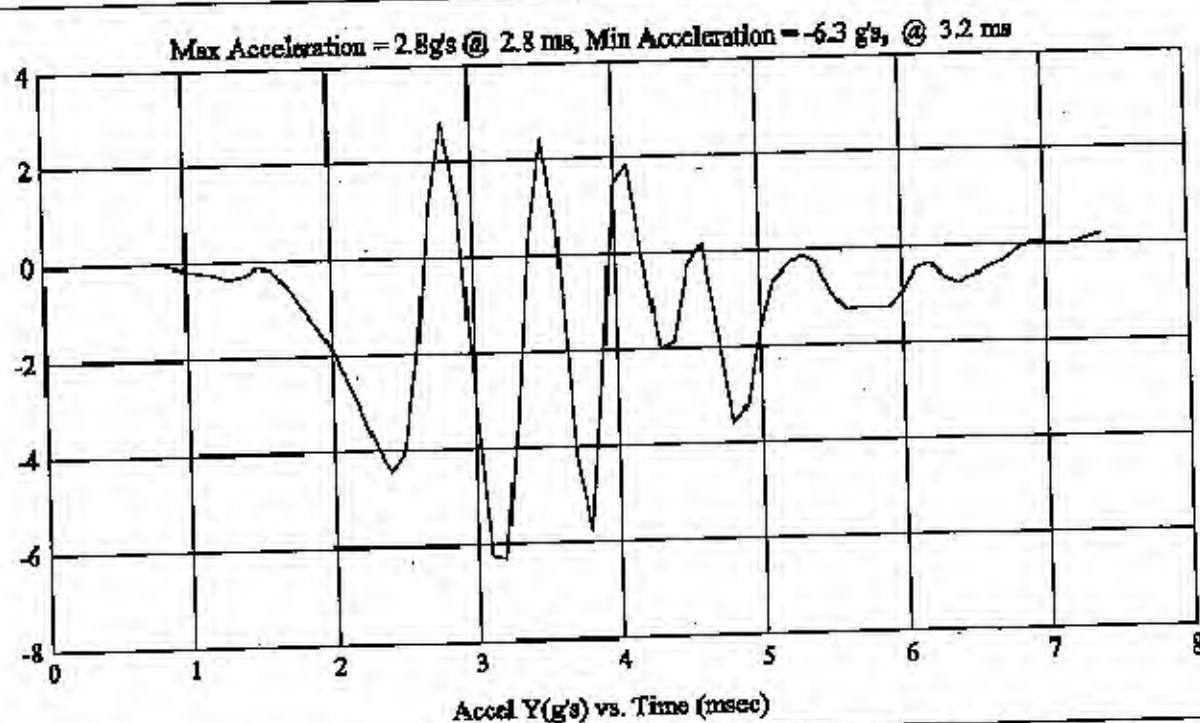
Test Number: H38257

MGA Job Number: G0517-001.2

Test Date: 12/2/04

Test Description: Post - Test Calibration

Head #: 38



Head Drop  
(Preliminary Test Report)

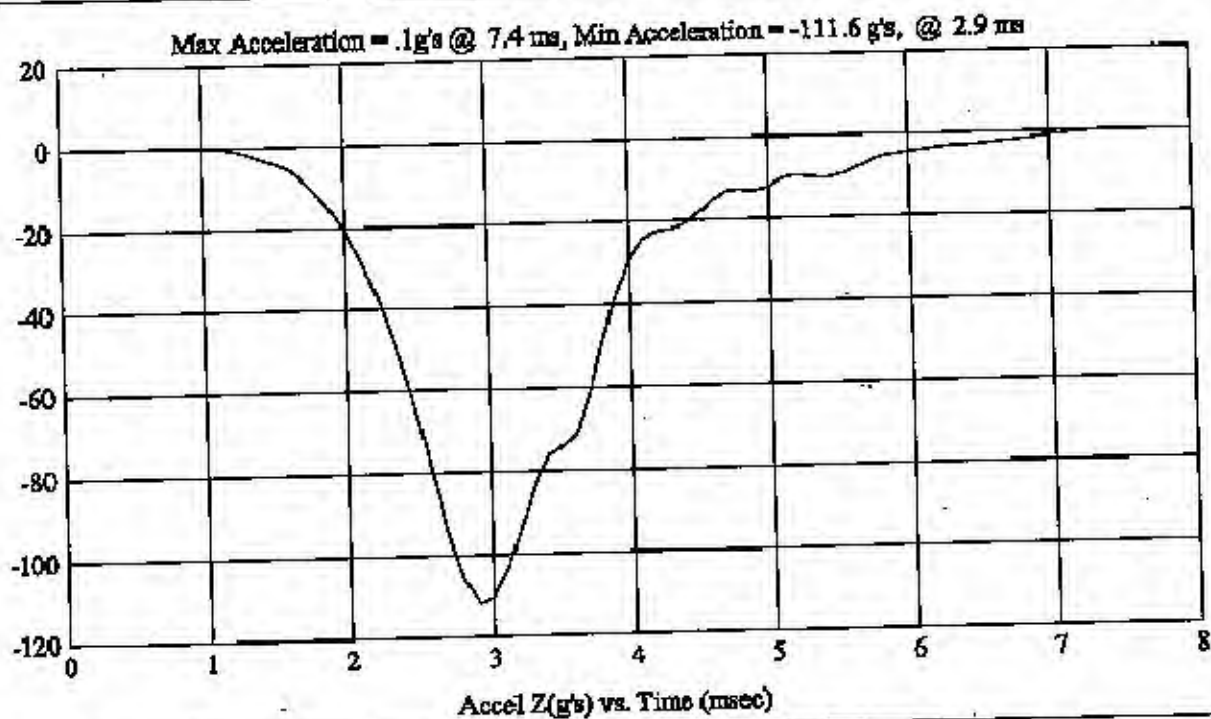
Test Number: H38257

MGA Job Number: G05I7-001.2

Test Date: 12/2/04

Test Description: Post - Test Calibration

Head #: 38











MGA RESEARCH CORP  
2005 SUGARHILL BLVD  
055501 11/17/04

AS DELIVERED

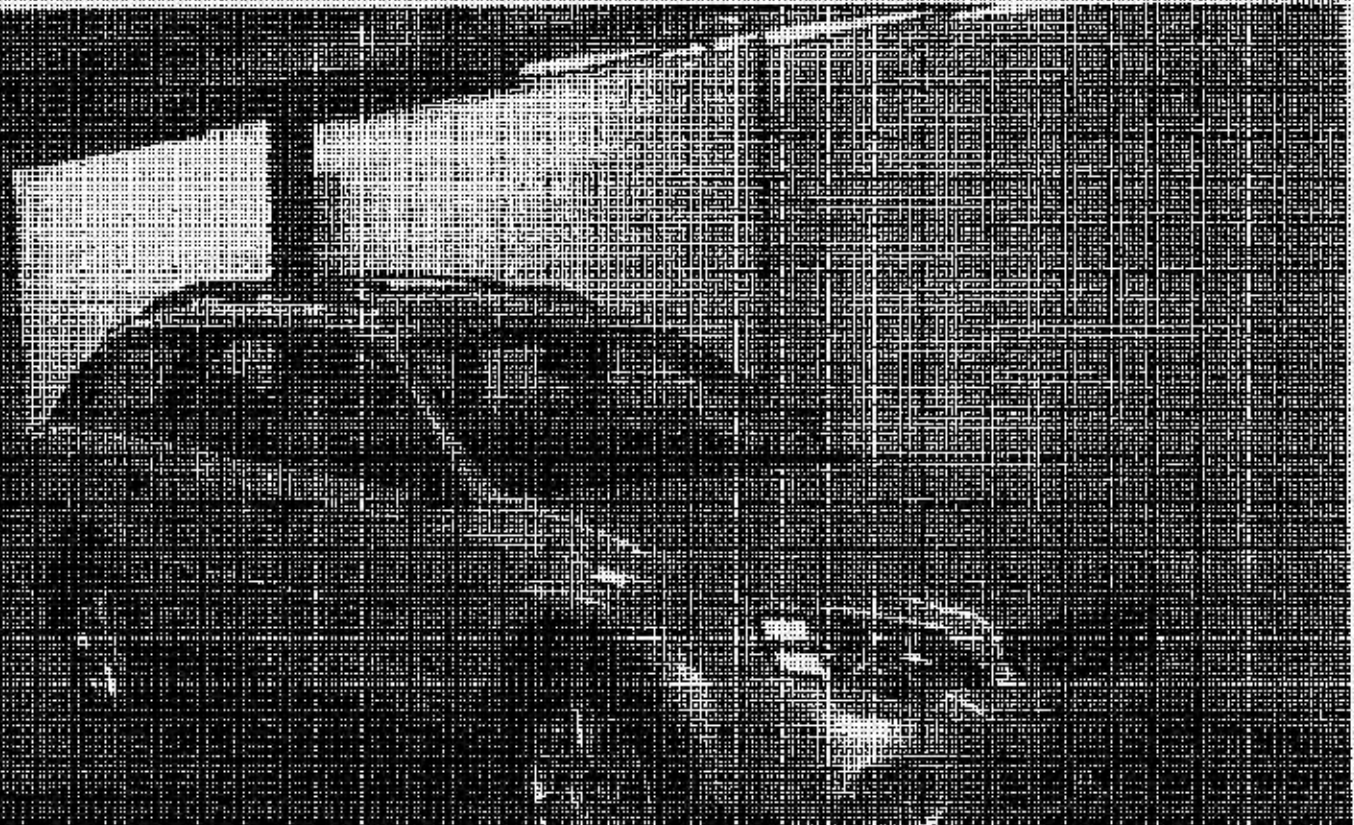




MGA RESEARCH CORP  
2004 SUBARU OUTBACK  
Q55361 11/17/04

AS DELIVERED





MGA RESEARCH CORP  
2005 ALIBARU OUTBACK  
CS5501 11/11/04

AS DELIVERED





SEATING CAPACITY: TOTAL 3

FRONT 2: REAR 1

THE COMBINED WEIGHT OF OCCUPANTS AND CARGO SHOULD NEVER EXCEED 400KG OF 880 LBS.

ORIGINAL TIRE SIZE	COLD TIRE INFLATION PRESSURE
P225/60R16	FRONT 220 KPA 32 PSI REAR 210 KPA 30 PSI
COMPACT SPARE TIRE	COLD TIRE INFLATION PRESSURE
115/70D17	420 KPA 61 PSI

SEATING CAPACITY: TOTAL 3



MADE BY FULL HEAVY INDUSTRIES LTD. DATE: 08/94  
CAUSE: 23401010000 WITH P23401010000 TIRE 16X6 1/2J 1300S AT 220 KPA (32 PSI) 2000  
CAUSE: 23401010000 WITH P23401010000 TIRE 16X6 1/2J 1300S AT 210 KPA (30 PSI) 2000  
23401010000 TO BE APPROVED BY THE VEHICLE  
23401010000 STEERING OR EFFECT ON  
IN CASE OF MANUFACTURE SHOW ABOVE

TYPE: 1300



ASSEMBLED BY CHANG OF INCHEN AUTOMOBILE INC. MADE IN U.S.A.

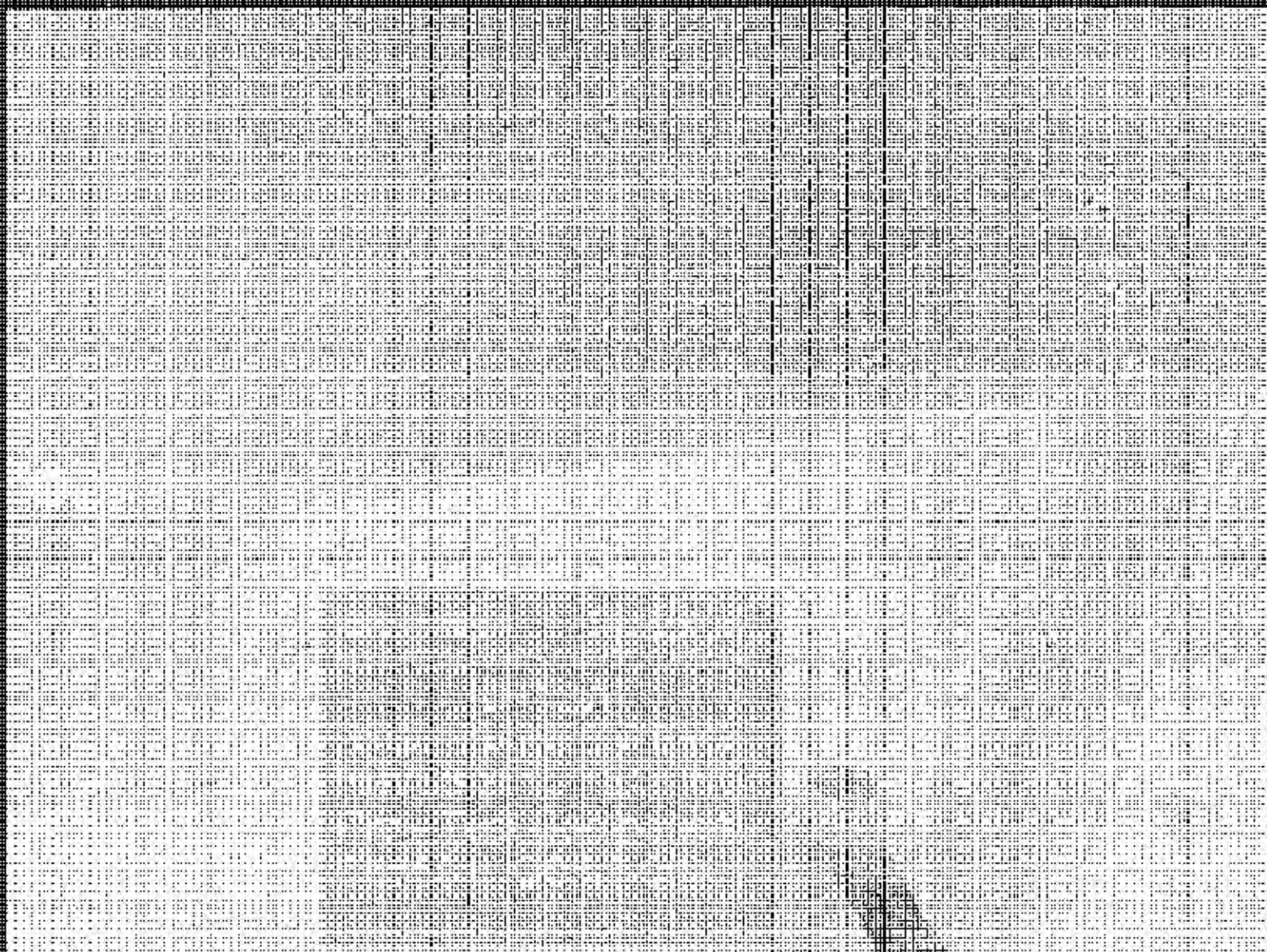




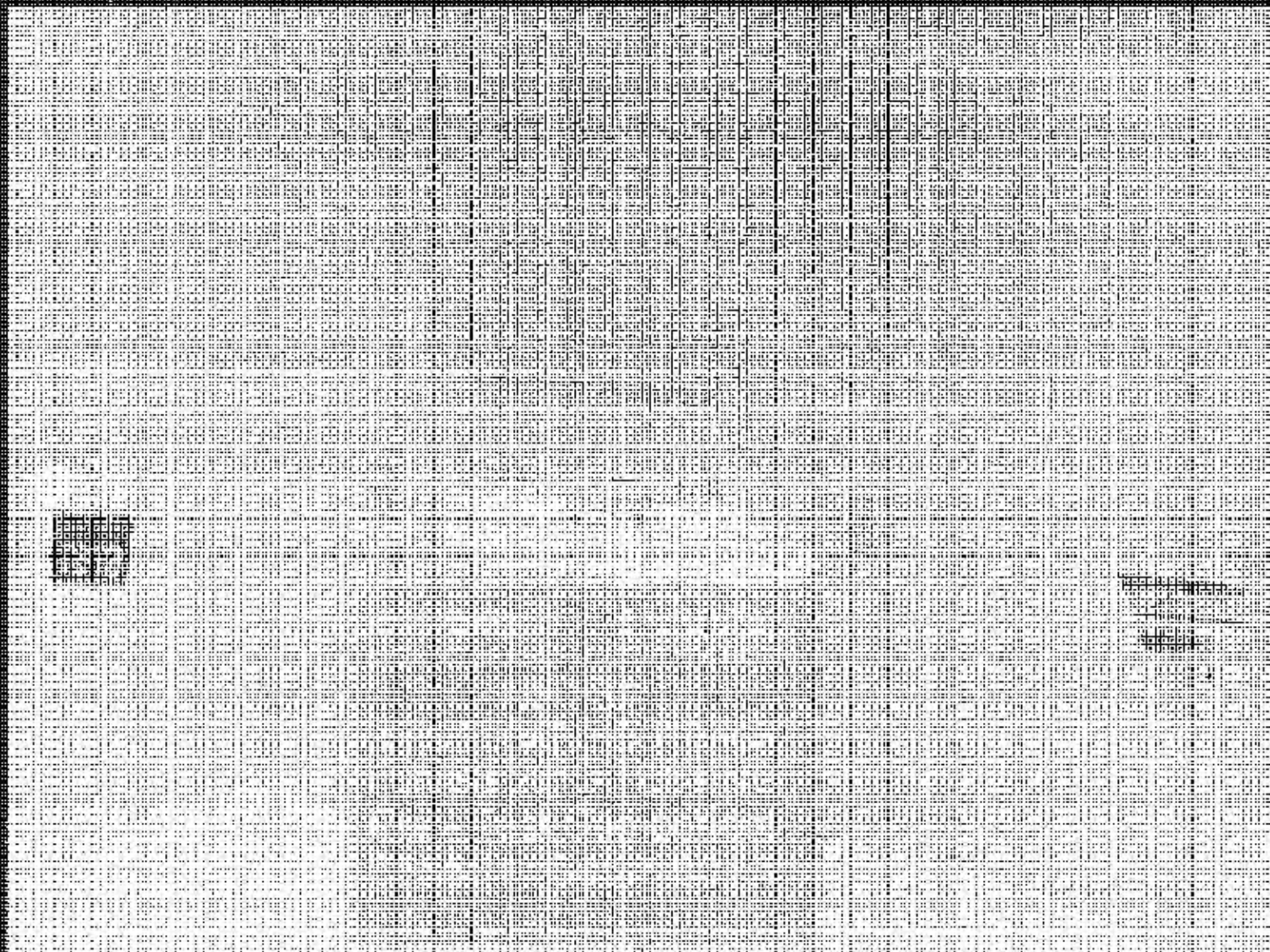








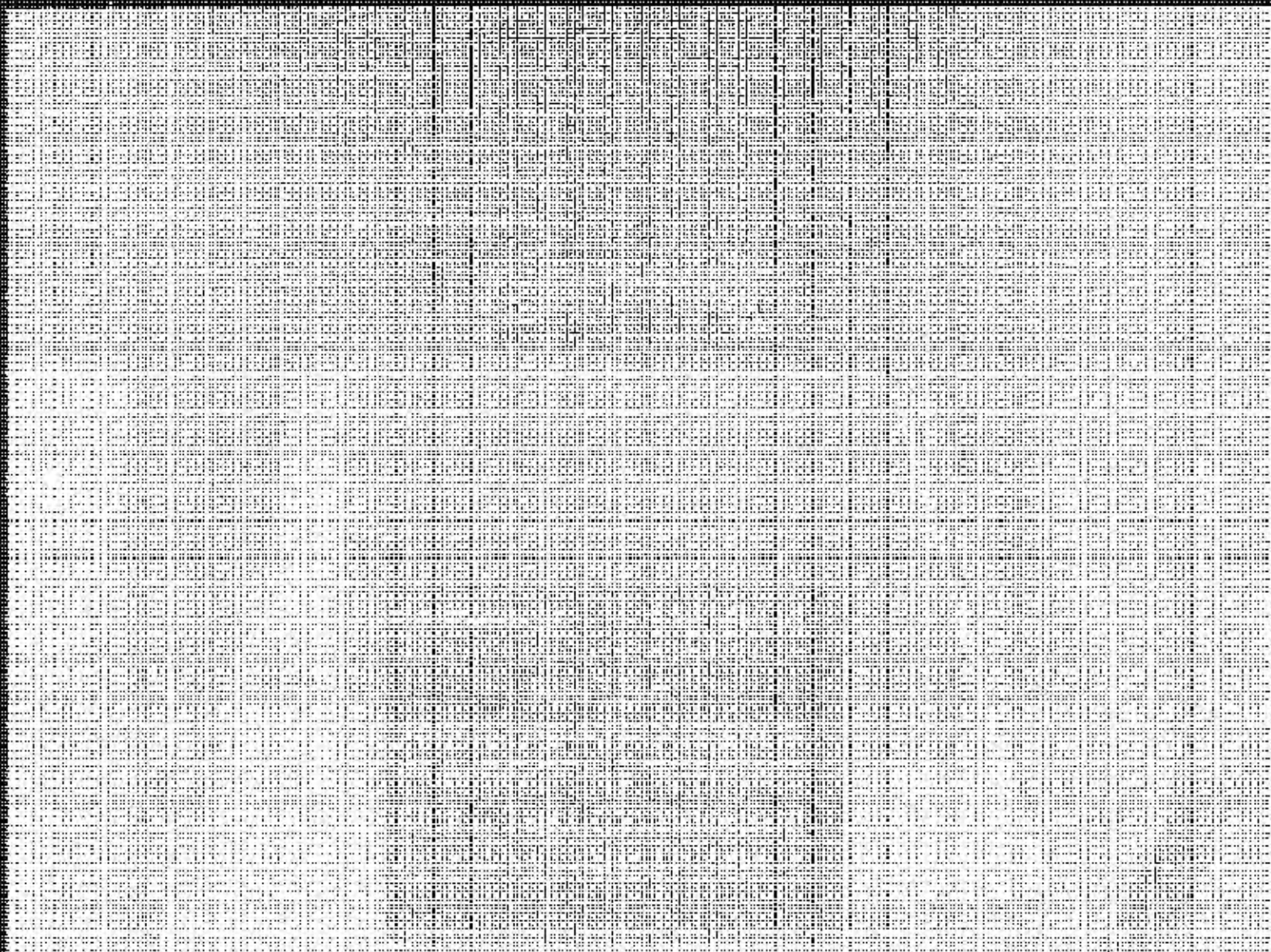




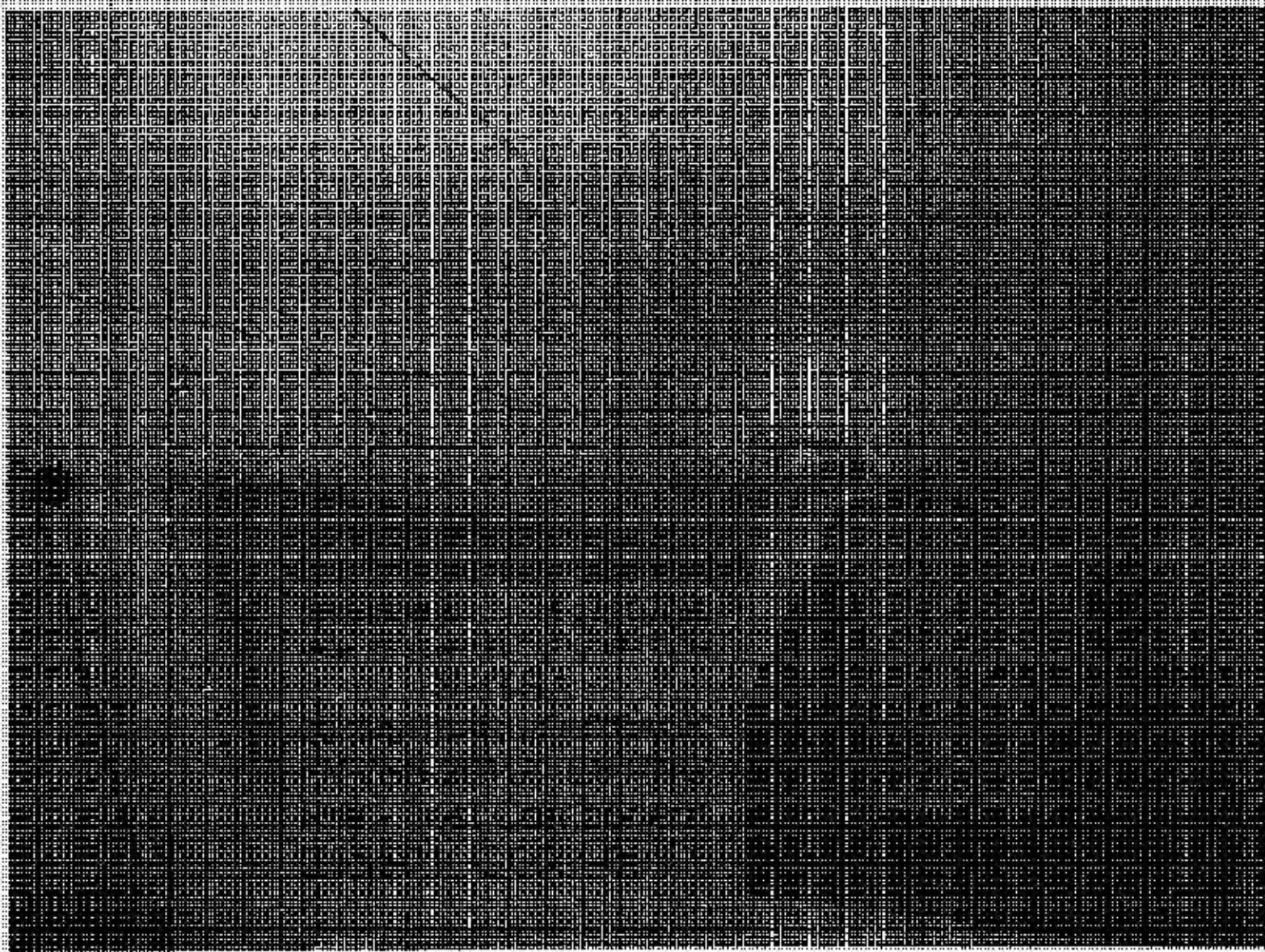




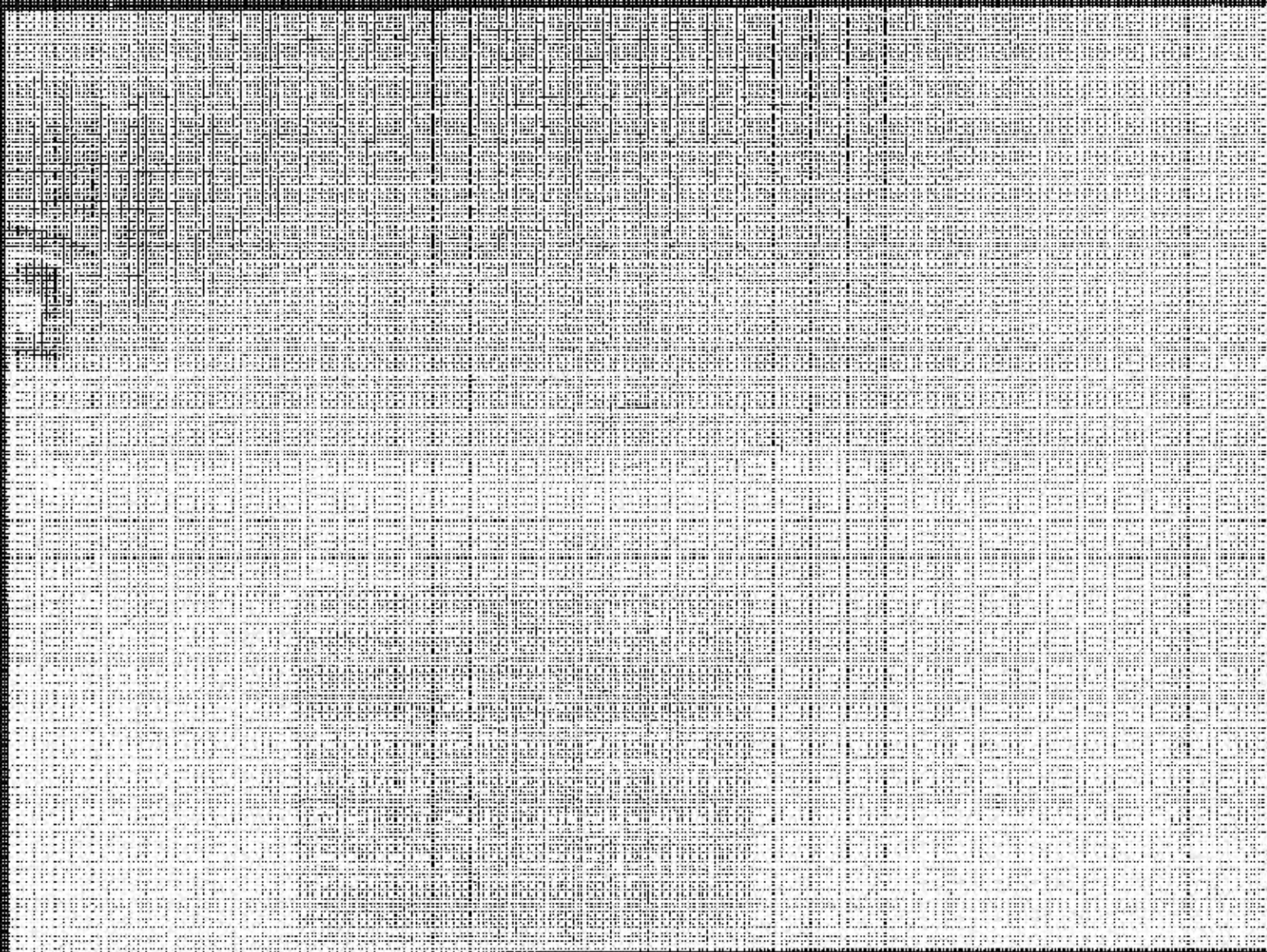




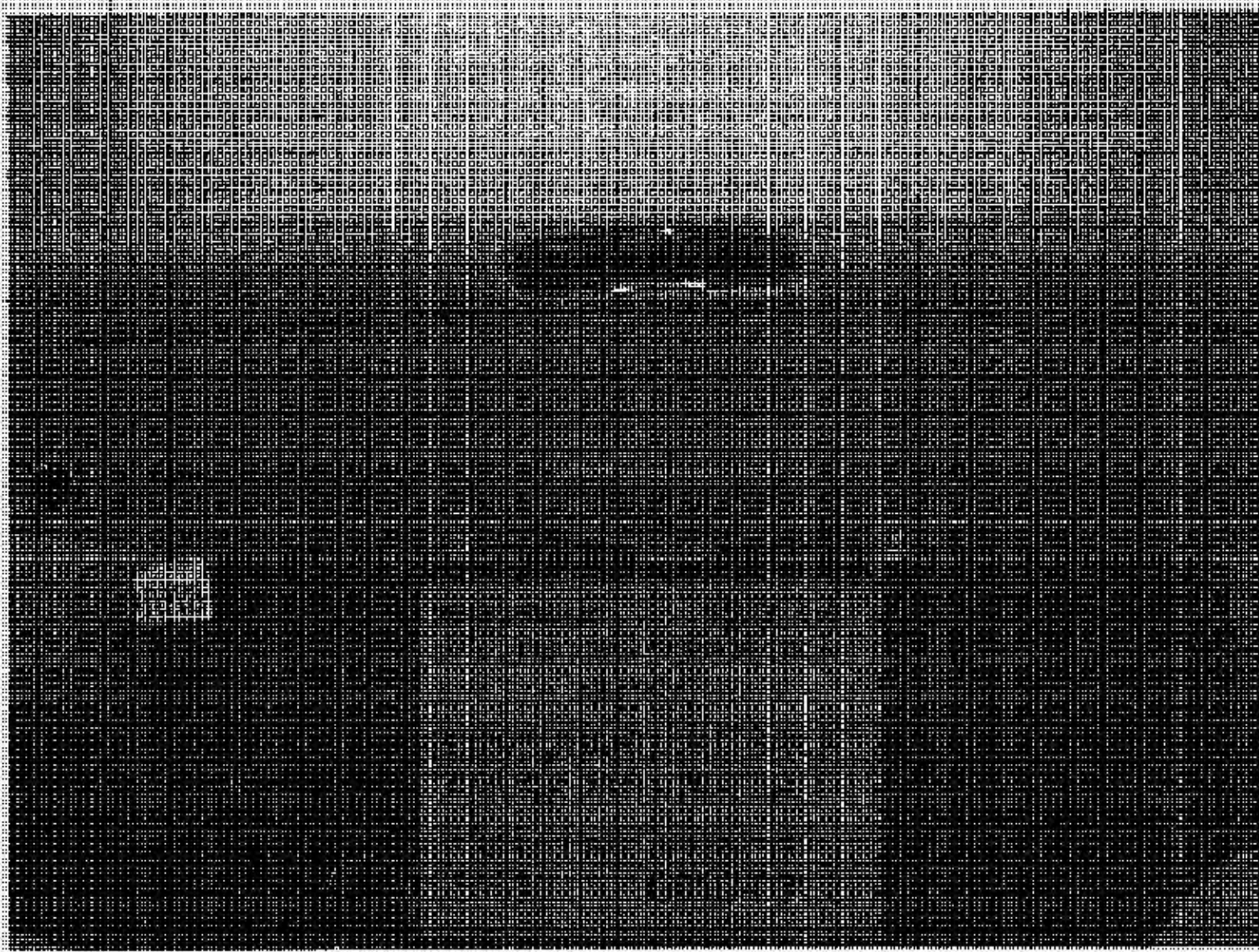








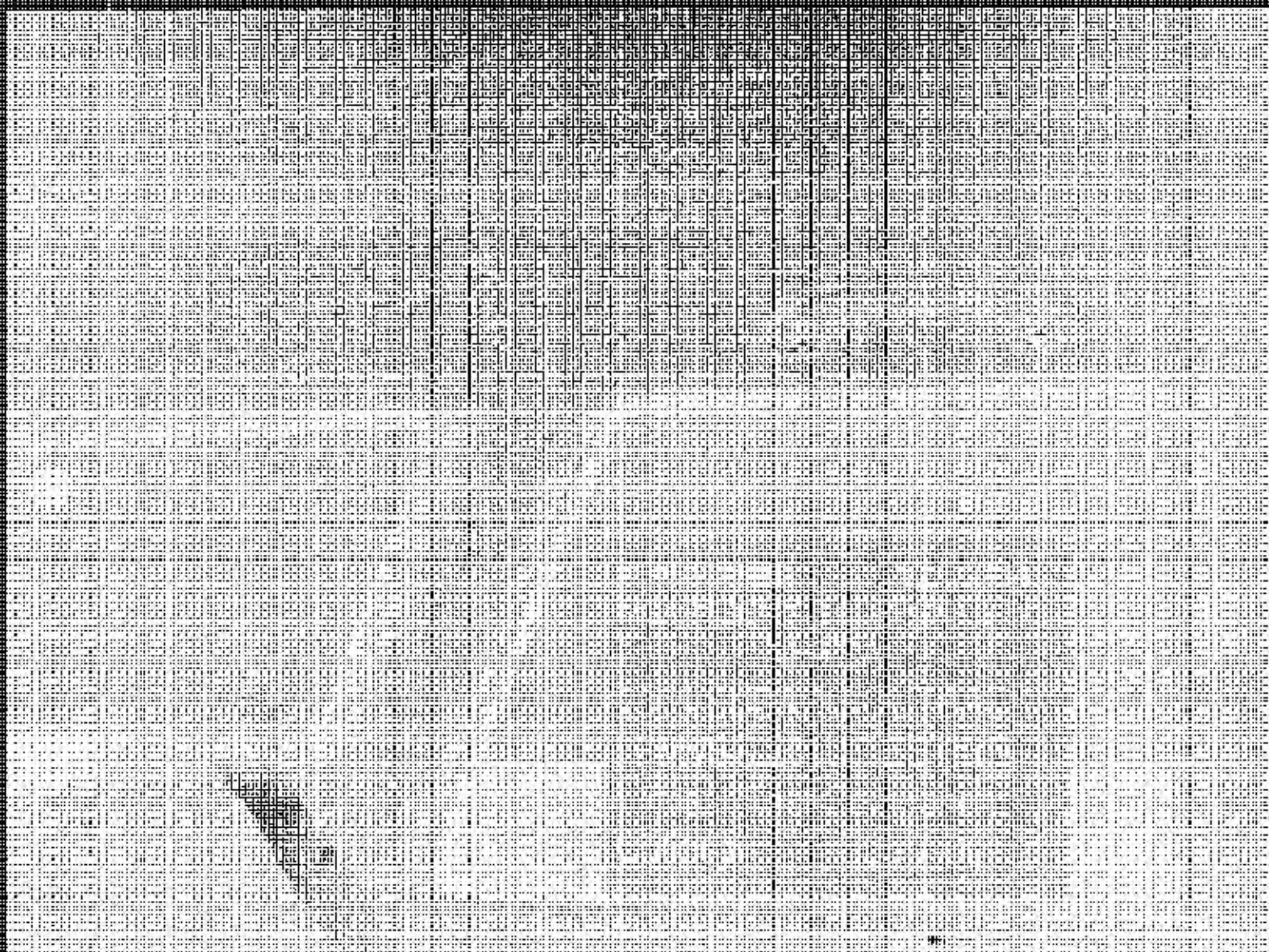




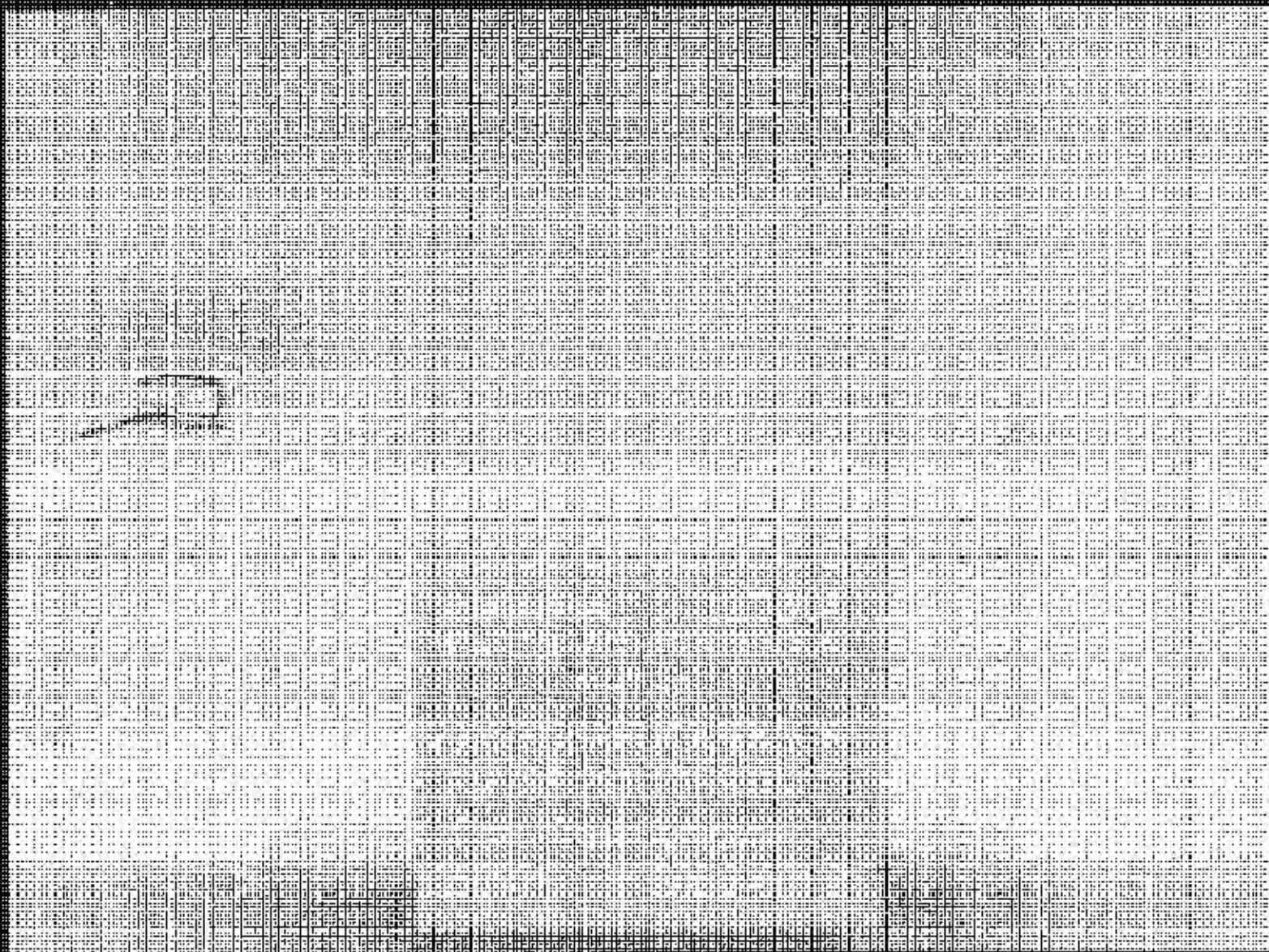








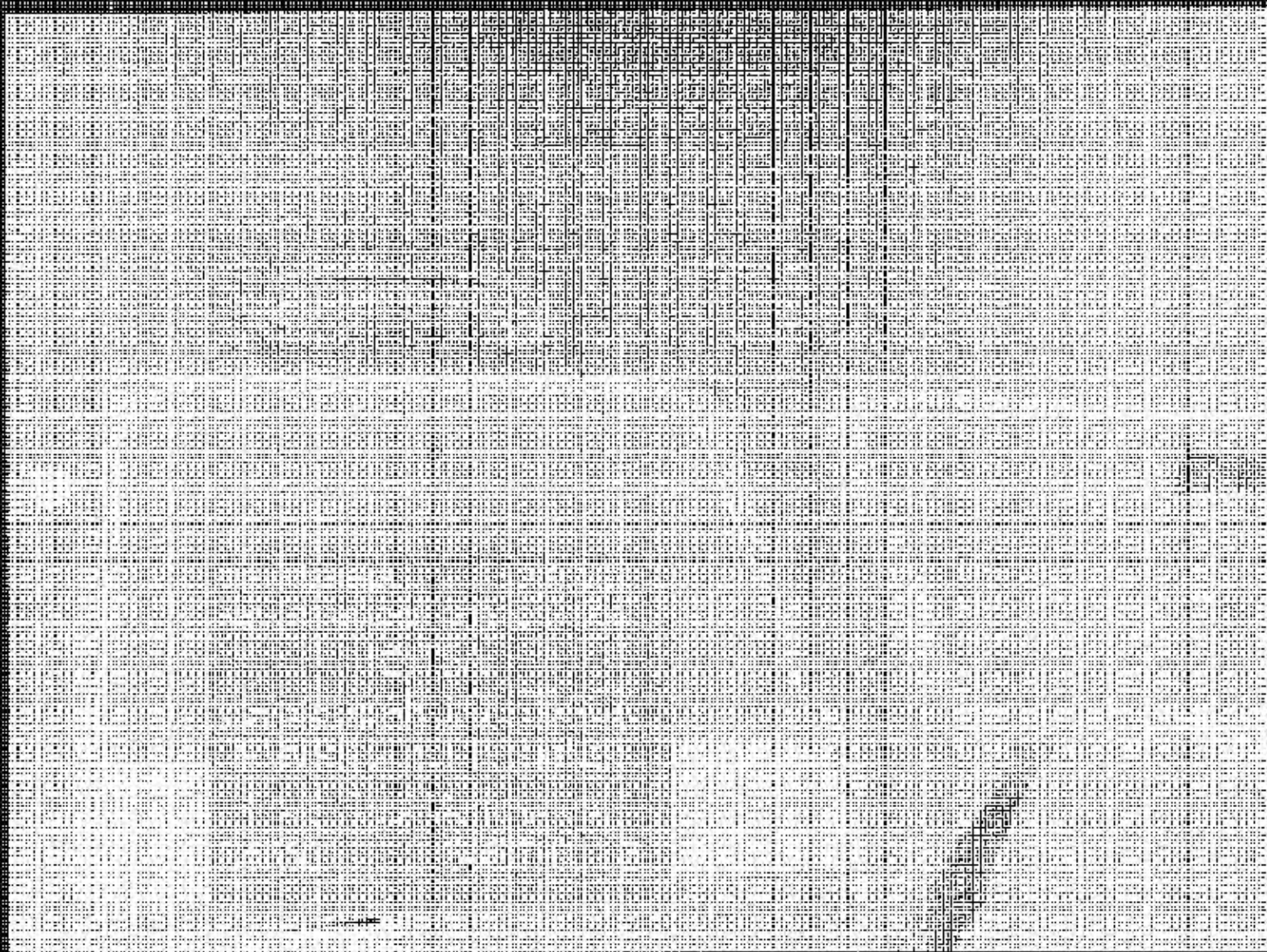




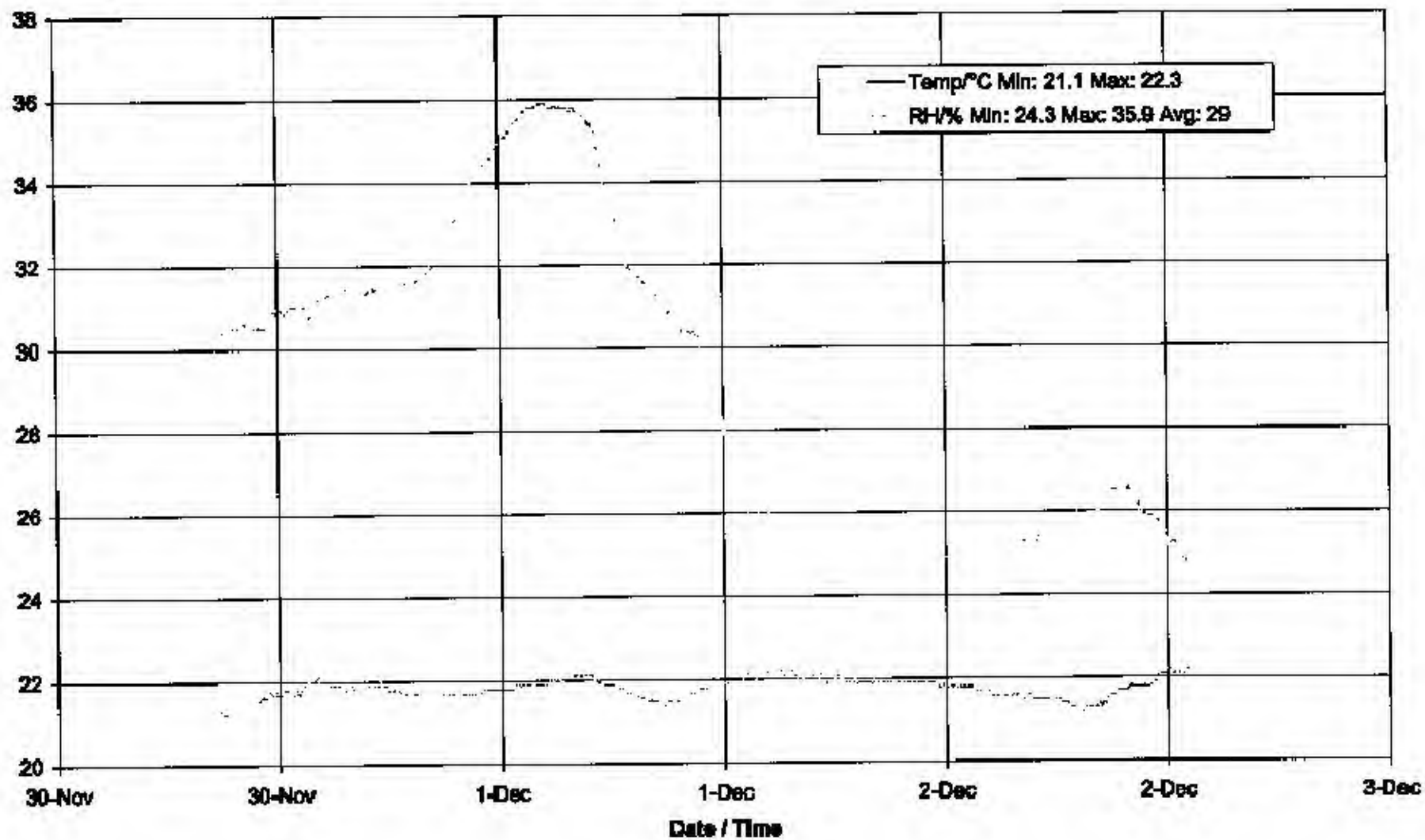








**C55501 2005 Subaru Outback FMVSS 201U**  
**Nov. 30 - Dec. 3 2004 Temperature Trace**







# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J35924	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chrs Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0424

New DLR (100k, Units: G): 94.1

StdDeviation (%): 0.247

% Difference in DLR (New vs. Old): 1.899

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 0.8\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

446 executive drive • troy, mi 48083

248 / 577-5001 • fax 248 / 577-5025

[www.mgaresearch.com](http://www.mgaresearch.com)



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J35919	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0424

New DLR (100k , Units: G): 94.3

StdDeviation (%): 0.198

% Difference in DLR (New vs. Old): 0.447

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 3.8\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J22664	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0424

New DLR (100k, Units: G): 92.7

StdDeviation (%): 0.495

% Difference in DLR (New vs. Old): 0.224

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 3.8\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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248 / 577-5001 • fax 248 / 577-5025  
[www.mgaresearch.com](http://www.mgaresearch.com)





# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J35916	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0424

New DLR (100k, Units: G): 99.6

StdDeviation (%): 0.348

% Difference in DLR (New vs. Old): -0.518


Temperature (°F): 72

Humidity (%): 35

Performed By:



Approved By:



All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 3.8\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor  $k=2$ .

**mga****mga research corporation****CALIBRATION CERTIFICATE**

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35918	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0424

New DLR (100k, Units: G): 98.1

StdDeviation (%): 0.137

% Difference in DLR (New vs. Old): 0.16

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 3.8\%$ .  
 All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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 248 / 577-5001 • fax 248 / 577-5025  
[www.mga-research.com](http://www.mga-research.com)



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35923	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0424

New DLR (100k, Units: G): 99.8

StdDeviation (%): 0.115

% Difference in DLR (New vs. Old): -1.016

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 3.8\%$ . All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor  $k=2$ .

446 executive drive • troy, mi 48063

248 / 577-5001 • fax 248 / 577-5025

[www.mga-research.com](http://www.mga-research.com)





# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J36197	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0423

New DLR (100k, Units: G): 110.0

StdDeviation (%): 0.117

% Difference in DLR (New vs. Old): 1.822

Temperature (°F): 72

Humidity (%): 32

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 1.6\%$ . All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor  $k=2$ .



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J36193	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0423

New DLR (100k , Units: G): 101.9

StdDeviation (%): 0.206

% Difference in DLR (New vs. Old): 0.497

Temperature (°F): 72

Humidity (%): 32

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±0.5%.  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J36353	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0423

New DLR (100k, Units: G): 96.7

StdDeviation (%): 0.158

% Difference in DLR (New vs. Old): -0.171

Temperature (°F): 72

Humidity (%): 32

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 0.8\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor  $k=2$ .





# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35800	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0422

New DLR (100k, Units: G): 98.4

StdDeviation (%): 0.266

% Difference in DLR (New vs. Old): -0.586

Temperature (°F): 72

Humidity (%): 24

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±0.8%.  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35841	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0422

New DLR (100k, Units: G): 92.6

StdDeviation (%): 0.092

% Difference in DLR (New vs. Old): -0.35

Temperature (°F): 72

Humidity (%): 24

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 0.3\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % confidence level using a coverage factor k=2.



# mga research corporation

## CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35791	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 11/9/04	Calibration Date: 5/11/04
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0422

New DLR (100k, Units: G): 88.8

StdDeviation (%): 0.323

% Difference in DLR (New vs. Old): -0.776

Temperature (°F): 72

Humidity (%): 24

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is  $\pm 3.8\%$ .  
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % confidence level using a coverage factor k=2.



# Intelligent Certification Document

Part Description

Single Point Element

Linear Drive

Certification Date

DATE

TIME

LOCATION

TESTER

TESTER

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# FARO

02/03/04

02/03/04

Lake Mary, FL 32746  
(407) 333-8036 Fax

Printed on 02/03/04 11:00 AM (C:\Program Files\FARO\bin\farocert.exe)

MECHANICAL OPERATIONS  
DATE: 11/24/03  
SUPERVISOR: MONTY WILSON

DOC. NO.: MONTY WILSON  
REVISION: 1.0  
PAGE: 1 OF 1

### Tape Measure Calibration Certificate

#### Reference Steel Rule

Brand: GEF  
S/N: 018033  
Calibration Date: 11-24-03

#### Subject Tape Measure

Brand: STANLEY  
S/N: 429  
Calibration Date: 11-5-04

Reference mm	Subject Tape Measure	Difference	Reference mm	Subject Tape Measure	Difference
0	0	0	450	450	0
25	25	0	475	475	0
50	50	0	500	500	0
75	75	0	525	525	0
100	100	0	550	550	0
125	125	0	575	575	0
150	150	0	600	600	0
175	175	0	625	625	0
200	200	0	650	650	0
225	225	0	675	675	0
250	250	0	700	700	0
275	275	0	725	725	0
300	300	0	750	750	0
325	325	0	775	775	0
350	350	0	800	800	0
375	375	0	825	825	0
400	400	0	850	850	0
425	425	0	875	875	0

If all differences are  $\pm 1$  mm, then the tape measure is acceptable.

Pass X Fail      Maximum Difference = 0

Date: 11-5-04

Performed By: RJW/H



Certificate Number: 20040201CMI

# Detroit Testing Laboratory, Inc.



7711 E. 17 Mile Road, Warren, MI 48090-2700 • (586) 754-0000 • FAX (586) 754-0048 • www.dtl-inc.com

## Certificate of Calibration

### Equipment Information

<b>Customer:</b>	MGA Research Corporation 446 Executive Drive Troy, MI 48063	<b>Model:</b>	Evo 360
<b>System ID:</b>	MGA00069	<b>Serial Number:</b>	NONE
<b>Customer Asset No.:</b>	MGA00069 (012904)	<b>Manufacturer:</b>	Minutryo
		<b>Description:</b>	Protractor

### Calibration Information

<b>Calibration Date:</b>	1/29/04	<b>Procedure Used:</b>	TIK6-4-1997-1/99
<b>Calibration Due:</b>	1/29/05	<b>Calibrated to:</b>	MFR SPBC
<b>Calibration Interval:</b>	12 Month	<b>Temperature:</b>	20 °C
<b>Rec'd In Test:</b>	No/Fail	<b>Humidity:</b>	28 %RH
<b>Returned In Test:</b>	Yes/Pass		
<b>Performed On Site:</b>	No		
<b>Calibration Limitation:</b>			

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: **Various**

<sup>1</sup> Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedures utilized, measurement experience, and the accuracy associated with this calibration. It is ultimately up to the user of this equipment to determine if this data meets their specific requirements for accuracy for its intended application.

### Calibration Standards Used

System ID	Model	Serial	Manufacturer	Description	Date Rec'd
60038	CT415H	61201094	Omega	Thermocouple/Graph	2/22/04
07245	2 X 2"	13928	TRU-STONE	Gemite Surface Plate	2/19/04
18493	SP-66-81	9902	Suburban Tool, Inc.	Sine Plate	2/17/04
09156	CHALLENGER 81 P QF156		A.A. JANSSON	Gage Block	2/5/04

Any calibration issued and the date of this document, if used, is at the request of the customer. This is the time that any applicable uncertainty may affect all of reported values over time; there is no warranty implied that this time will maintain its stated accuracy through the end of this process.

This Calibration has been performed per requirements of ISO 17025-1995. Reported results are from standards with accuracies that are traceable to the International System of Units (SI), derived from physical constants, with measurements, national measurement standards, or compared to consensus standards. Measurement uncertainty is expressed as a confidence level of approximately 95% (coverage factor k=2).

<b>Signature:</b> <i>Paul Womack</i>	<b>Date:</b> 1-29-04	<b>Approved:</b> <i>Robert White</i>	<b>Date:</b> 1/29/04
<b>Paul Womack</b>	<b>Technician</b>		
<b>Date Printed:</b> 01/29/04	<b>Printed By:</b> Paul Womack	<b>Page:</b> 1 of 2	<b>QPC 1048-1 Rev 01/03</b>

Detroit Testing Laboratory, Inc. hereby certifies that the data reported on this document are the result of measurements made by its personnel using equipment that is calibrated to the International System of Units (SI), derived from physical constants, with measurements, national measurement standards, or compared to consensus standards. Measurements are made by the customer on their own equipment. Measurements, including reports on other items of value, without prior written approval, are not permitted to be used by the customer on their own equipment. Measurements, including reports on other items of value, without prior written approval, are not permitted to be used by the customer on their own equipment.



Form F410/12-3 Revision Date 03-11-03  
 Revision Level: E  
 STANDARD FORM

20950 Boening St.  
 Southfield MI 48075  
 Phone (248) 358-0590 Fax (248) 355-2529

# Sterling Scale Company Inc. Scale Certificate of Calibration

Customer: MGA Research  
 Location of Calibration: 446 Executive Dr.  
Troy, MI 48063  
 Certification Number: 6774  
 Date of Calibration: 8-16-2004  
 \*\*Next Calibration Due: 8-2005  
 Environmental Condition: ☒ Good ☐ Fair ☐ Poor

Make:	Model:	Serial/ID#:	Capacity:
<u>S.W. Scales</u>	<u>S.W. Deluxe</u>	<u>26032309</u>	<u>6000x146</u>

This certifies that the above scale has been calibrated using the relevant EPO, original equipment manufacturer calibration procedures along with Handbook 44 tolerances using weights traceable to the National Institute of Standards and Technology as well as the International Systems of Units (SI).

Sterling Scale Weight/Weight kit serial #: 1160, 10002, 50967, 20600, 2015, 20150

Calibrated to class: III

Date Weight/Weight kit calibrated: 9/03

Date Weight/Weight kit due: 9/05

Expanded Uncertainty ( $k=2$ ) confidence level of 95% is reported with the before and after readings on next page.

Temperature 72° Humidity 60% Pg 1 of 3

These items relate only to these results

Tolerances followed are NIST/ANSI acceptance per HB-44

This report shall not be reproduced, except in full, without written approval of the laboratory.

\*\* Any number of factors may cause the calibration team to drift out of calibration before the recommended interval has expired.

The reported uncertainty is valid only for the environment in which it is determined.



1448.01

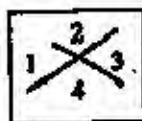
Form F410/12-3 Revision Date 03-11-03  
 Revision Level: B  
 STANDARD FORM

20950 Boonung St.  
 Southfield MI 48075  
 Phone (248) 358-0590 Fax (248) 358-0590

### Sterling Scale Company Inc. Scale Certificate of Calibration

Applied Test Weight	Before Adjustment	Tolerance H-	In tolerance Y / N	After Adjustment	In tolerance Y / N	Expanded uncertainty
50 lb	50 lb	1 lb	Y	50 lb	Y	.003 lb
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.04 lb
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13
50 lb	50 lb	1 lb	Y	50 lb	Y	.003
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13

Shift test



*N/A - Shift test*

	1	2	3	4
Before Adj.				
After Adj.				

Scale condition at front: Good

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ Scale Certified

☐ Scale Rejected

If scale is rejected, why?

Larry / Larry  
 Sterling Scale Service Rep.

Date: 8-11-04

re 2-2-3

These items relate only to these results.  
 This report shall not be reproduced, except in full, without written approval of the laboratory.  
 Tolerances allowed are maintenance tolerances per NIST-44  
 \*\* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.



1048.01

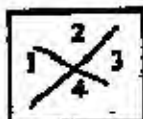
Form: P410/12-3 Revision Date 03-11-03  
 Revision Level: E  
 STANDARD FORM

20930 Boming St.  
 Southfield MI 48075  
 Phone (248) 352-0590 Fax (248) 352-0590

**Sterling Scale Company Inc.**  
**Scale Certificate of Calibration**

Applied Test Weight	Before Adjustment	Tolerance +/-	In tolerance Y / N	After Adjustment	In tolerance Y / N	Expanded uncertainty
50 lb	50 lb	1 lb	Y	50 lb	Y	±0.03
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	±0.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	±0.13
50 lb	50 lb	1 lb	Y	50 lb	Y	±0.03
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	±0.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	±0.13

Shift test:



N/A - Small and

	1	2	3	4
Before Adj				
After Adj				

Scale condition as found: Good

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ Scale Certified

☐ Scale Rejected

If scale is rejected, why?

Long / Long  
 Sterling Scale Service Rep.

Date: 8-11-04

or 343

These tests relate only to these weights.  
 This report shall not be reproduced, except in full, without written approval of the laboratory.  
 Tolerances followed are maintenance/acceptance per NIST-44  
 \*\* Any number of factors may cause the calibration team to drift out of calibration before the recommended interval has expired.



1445.01





Certificate Number: 20040729Cal

# Detroit Testing Laboratory, Inc.



1111 E. 11 Mile Road, Warren, MI 48090-2792 • (586) 764-9006 • FAX (586) 764-8040 • www.dtl-lab.com

## Certificate of Calibration

### Equipment Information

Customer: MGA Research Corporation  
446 Executive Drive  
Troy, MI 48063

Model: A1 20  
Serial Number: E33603-0213  
Manufacturer: Detroit  
Description: Scale

System ID: MGA00081

Customer Asset No.:

### Calibration Information

Calibration Date: 3/24/04  
Calibration Due: 3/24/05  
Calibration Interval: 12 Month  
Revd In Tol:<sup>1</sup> Yes/Pass  
Returned In Tol:<sup>1</sup> Yes/Pass  
Performed On Site: No

Procedure Used: 33K6-4-72-1/98  
Calibrated to: MPR SPEC

Temperature: 24 °C  
Humidity: 37 %RH

Calibration Limitations:

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be:  $(0.006 + 0.01\% \text{ Ind})$  lb

<sup>1</sup> Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for its intended application.

### Calibration Standards Used

System ID:	Model:	Serial:	Manufacturer	Description:	Date Due:
09126	CT4853B	61201050	OMEGA	Thermochrom/Display	5/12/04
07580	CLASS C	07580	TROEMNER	WEIGHT SET	9/11/04

Any calibration interval and due date of this device, if stated, is at the request of the customer. Due to the fact that many variables may affect drift of equipment over time there is no warranty implied that this item will maintain its stated accuracy throughout the end of this interval.

This Calibration has been performed per requirements of ISO 17025-1997. Reported results are from standards with uncertainty that are traceable to the International System of Units (SI), derived from physical constants, radio measurements, national measurement standards, or compared to consensus standards. Measurement uncertainty is expressed as a confidence level of 95% (coverage factor k=2).

Signature: <u>Jerry Wells</u> Jerry Wells	Date: <u>3-24-04</u> Technician	Approved: <u>Paul W.</u> Date: <u>3-24-04</u>
Date Printed: 03/24/04	Printed By: Jerry Wells	Page: 1 of 2 QFC 1048-1 Rev 4/17/03

Detroit Testing Laboratory, Inc. does not accept liability for the calibration or of consequences to whom they were calibrated and shall not be responsible, except as set forth, without the written approval of the Laboratory. Our letters, reports, and certificates apply only as those items stated. The use of the name Detroit Testing Laboratory, Inc. or its logo or insignia, are not permitted to be used by its customers for their commercial direct business, advertising, signage or other forms of media, without prior written approval.

# ~Certificate of Calibration~

Model Number: 484B	N.L.S.T. Project #: 5720012
Serial Number: 2470	Calibration Date: 05/11/2004
Description: Signal Conditioner	Recalibration Date:
Test Procedure: AT-108-1	Calibration Technician: Chris Vega <i>CV</i> #36
Temperature: 74° F	Relative Humidity: 42%

<u>TESTS</u>	<u>BEFORE</u>	<u>AFTER</u>
INPUT VOLTAGE ( $24 \pm 0.1$ V)	24.02	24.02
ICP CURRENT ( $4 \pm 0.6$ mA)	3.97	3.97
DC OFFSET A.C. MODE (volts)	-.001	-.001
GAIN (REF 1 VRMS, 1 kHz)	1.0000	NOT ADJUSTABLE
DRIFT (DC MODE)	< 2mV/min.	NOT ADJUSTABLE
FREQUENCY RESPONSE 10 Vp-p, 1 kHz REFERENCE	FLAT TO 200kHz	NOT ADJUSTABLE

As Received: In tolerance

As Left: In tolerance

Special Notes: MGA Research

This document certifies that the equipment referenced above meets published specifications. The calibration procedure is in compliance with ISO 10012-1, and former MIL-STD-45662A and is traceable to NIST. Measurement uncertainty (95% confidence level) where appropriate factor of 2) for scale factors is  $\pm 0.2\%$ .

This certificate may not be reproduced, except in full, without written approval of

# ~ Calibration Certificate ~

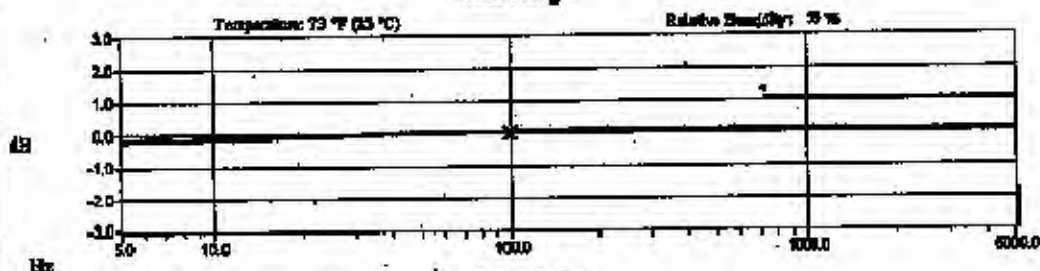
Per-ISO 10002-21

Model Number: SP10001404B (S9-0M17 SYSTEM)Serial Number: 8622470Description: ICP® AccelerometerMethod: Back-to-Back Comparison CalibrationManufacturer: PCB

## Calibration Data

Sensitivity @ 166.0 Hz    **91.17 mV/g**    Output Bias    **1.6 VDC**  
                                   **(3.179 mV/m/s²)**    Transverse Sensitivity    **3.0 %**

## Sensitivity



## Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
5.0	-2.5	REF. FREQ.	0.0	5000.0	1.1
10.0	-1.9	300.0	0.7		
15.0	-1.4	500.0	0.8		
30.0	-0.6	1000.0	1.0		
50.0	-0.2	3000.0	1.1		

Identification: Station No. of calibration traceability    Period: 12 Months    Validity: 12 Months  
 The calibration system is used for the calibration of the following instruments: Acceleration (g) and Hz  
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 The calibration system is used for the calibration of the following instruments: Acceleration (g) and Hz

## Condition of Unit

As Found: In Tolerance, No Adjustment NecessaryAs Left: In Tolerance

## Notes

1. Calibration is NIST Traceable thru Project 822/267400 and PTB Traceable thru Project 1055.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCSL Z540-3-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz: +/- 1.0%, 10-99 Hz: +/- 1.5%, 100-1999 Hz: +/- 1.0%, 2-10 kHz: +/- 2.5%.

Technician: Chris DiMaggio CDO    Date: 06/12/04

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# PCB PIEZOTRONICS™

VIBRATION DIVISION

3425 Walnut Avenue    Dayton, NY 14843

TEL: 716-474-0013    FAX: 716-465-3116    www.pcb.com

07-1000000-00



# Certificate of Instrument Calibration and Testing

## Customer Information

Dickson Model/Number: **TR-300**

Serial Number: **00015-000**

Calibration/Test Facility: **TR-300**

Calibration Date: **01/10/04**

## Calibration Standards

Calibration Standards used in this calibration were NIST traceable and were found to be within the required tolerance limits. The calibration was performed in accordance with the requirements of the NIST Handbook 44-100, and the results are shown on the attached calibration report. The calibration was performed by a qualified technician and the results are shown on the attached calibration report.

## Calibration Procedures Used

The calibration procedures used in this calibration were NIST traceable and were found to be within the required tolerance limits. The calibration was performed in accordance with the requirements of the NIST Handbook 44-100, and the results are shown on the attached calibration report. The calibration was performed by a qualified technician and the results are shown on the attached calibration report.

## Environmental Conditions

Parameter	Value	Unit
Temperature (°C)	20.0	°C
Humidity (%)	45	%
Pressure (kPa)	101.3	kPa
Relative Humidity (%)	45	%
Temperature (°F)	68.0	°F
Humidity (%)	45	%
Pressure (kPa)	101.3	kPa
Relative Humidity (%)	45	%

The calibration was performed in accordance with the requirements of the NIST Handbook 44-100, and the results are shown on the attached calibration report. The calibration was performed by a qualified technician and the results are shown on the attached calibration report.

## FOR YOUR NEXT CALIBRATION NO PHONE CALLS REQUIRED

Fill out and send this form along with your instrument to Dickson Calibration Services, Inc. for calibration. No phone calls required.

1. Complete Order Form

Name: \_\_\_\_\_

Phone: \_\_\_\_\_

Model #: **TR-300**

Serial #: **00015-000**

2. Please return the

Calibration Report

to Dickson Calibration Services, Inc.

3. New Equipment

Calibration Report

4. Please return the

Calibration Report

to Dickson Calibration Services, Inc.

5. New Equipment

Calibration Report

to Dickson Calibration Services, Inc.

6. New Equipment

Calibration Report

to Dickson Calibration Services, Inc.

7. New Equipment

Calibration Report

to Dickson Calibration Services, Inc.

8. New Equipment

Calibration Report

to Dickson Calibration Services, Inc.

## Dickson Calibration Services